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EVALUATION OF USER INFORMATION SATISFACTION OF THE AUTOMATED QUALITY OF CARE EVALUATION SUPPORT SYSTEM

by

James Runyan Booth
and
John Linwood Bryant, Jr.

September, 1991

Thesis Advisor: Moshe Zviran

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Evaluation of User Information Satisfaction of the Automated Quality of Care Evaluation Support System

by

James Runyan Booth
Lieutenant Commander, United States Navy
B.S., Alabama State University, 1974

and

John Linwood Bryant, Jr.
Lieutenant, United States Navy
B.S., Rutgers University, 1982

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ABSTRACT

This thesis investigates the level of User Information Satisfaction of the Automated Quality of Care Evaluation Support System (AQCESS) and the Composite Health Care System (CHCS). A User Information Satisfaction questionnaire was administered to AQCESS users at Silas B. Hays (Army) Hospital, Fort Ord, California and the Naval Hospital, Pensacola, Florida. The findings from the AQCESS system are compared to those obtained from the CHCS system at Naval Hospital, Charleston, South Carolina.

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I. INTRODUCTION

A. OVERVIEW

Top management personnel often attempt to quantify or measure the value of information systems technology to their organization. Managers within the Information Systems (IS) community, in turn, debate and search for improved techniques to measure and, otherwise, make improvements to both existing and future systems.

In 1984 and 1986, the Society for Information Management (SIM) along with the Management Information Systems Research Center (MISRC) conducted surveys to determine key information systems issues facing IS executives/managers over the next five years. An issue ranked among the top ten in importance and one which has long been an IS management problem was system effectiveness and its measurement (Brancheau and Wetherbe, 1987).

Inasmuch as the Department Of Defense (DoD) has a number of large, expensive information systems being used at various Medical Treatment Facilities, a simple and efficient method to measure and analyze the effectiveness of these systems is essential. This is a very difficult concept to narrow down because of differing opinions or ideas of value (ie; economic,

efficiency, effectiveness, user satisfaction, etc.). Many scholars of this problem have determined and agreed that all of these factors are important ones, however, there is a need to concentrate on the effectiveness of a system in terms of user interface. In other words, user satisfaction of the system. This is due to the fact that no matter how "good" the system may be, if the user is not satisfied with it, it becomes worthless. However, if the user is satisfied, the system may be considered to be effective, provided all other organizational objectives are met.

B. RESEARCH OBJECTIVES

This study is a follow-on to the Evaluation of User Information Satisfaction of the Composite Health Care System (CHCS) (Hurd, 1991) and will empirically evaluate the effectiveness of the Automated Quality of Care Evaluation Support System (AQCESS) and compare them to those found for CHCS. A standardized, previously validated, satisfaction survey was administered to users of AQCESS at the Naval Hospital, Pensacola, Florida and Silas B. Hayes Hospital, Fort Ord, California to measure intrinsic satisfaction characteristics. The results of the survey will be analyzed using relevant statistical methods in order to identify and document problem areas if they exist, as well as those areas considered to be positive aspects of the system. Upon completion, this study will formulate a baseline measure of

the AQCESS user's satisfaction at both sites and investigate possible cause and effect relationships. Future comparisons can be made using the same standard survey at the study hospital or at other facilities.

II. THE AUTOMATED QUALITY OF CARE EVALUATION SUPPORT SYSTEM

B. BACKGROUND

The Tri-Service Medical Information Systems (TRIMIS) Program Office was formally created in July 1974, by the Department of Defense Assistant Secretaries of Defense (Comptroller, Health and Environment). The program, which is now part of Defense Medical Systems Support Center (DMSSC) of the Office of the Assistant Secretary of Defense Health Affairs, was assigned the task of consolidating previous service efforts and to "improve the effectiveness and economy of health care delivery in the Army, Navy and Air Force." TRIMIS refined its mission objectives by stating that it would develop automated information systems for timely patient-centered health data. These systems would support medical services, clinical research, epidemiological studies and health care information.

The Hospital Services Program Office (HSPO) developed a computer supported clinical records and patient administration system using the MUMPS language combined with certain utilities from the Veterans Administration File Manager. The system received extensive tri-service input and was designed

incorporated comprehensive service-specific information to ensure accurate and reliable data accumulation. The system was also designed to be user-friendly (easy to learn, able to provide online assistance, and able to operate without dedicated computer operators/special environmental conditions). The MUMPS language allowed for Hardware flexibility (easily modified to correct problems and integrate additional requirements). Development of this system, however, was suspended following redirection of the TRIMIS program in March of 1984. (AQCESS User Manual, Issues 2.0, 2.2, 2.4)

B. AQCESS PURPOSE

In August of 1984, the Health Affairs Office of the Assistant Secretary of Defense identified medical quality assurance as being a priority within the military health care system. The TRIMIS Office, along with representatives from the Army, Navy and Air Force, were requested by the Professional Affairs and Quality Assurance Office of the Deputy Assistant Secretary of Defense to develop and implement a computer supported information system at all DoD hospitals by 1985. The resulting system was the Automated Quality of Care Evaluation Support System (AQCESS). This system, also written in MUMPS, was designed to satisfy the following objectives: (1) Collect and report clinical, administrative and managerial information necessary to support inpatient

administration of the medical quality assurance programs within DoD; (2) Improve the quality and timeliness of health care evaluation; and (3) Support the identification of variations that would adversely affect the quality of health care. (Assistant Secretary of Defense, Health Management Systems, 1984)

C. AQCESS SYSTEM MODULES

AQCESS is an interactive, mini-computer based, online computer system. It includes the following modules:

1. Admission and Disposition

Admission and Disposition addresses patient registration, admission, transfer, disposition, bed management, inpatient history and reporting. The user inputs patient information/data onto a formatted screen and has the capability to manipulate (ie; edit, view, cancel, track, print, validate) as necessary. From there, a number of other items may be generated (ie; register number, remarks section, inpatient history, query of patient database, general/specific reports).

2. Clinical Records

Clinical Records includes documentation on patient episodes, diagnosis and procedure data capture, patient day computation, record tracking and reporting. The user can collect, edit, validate, display, track various items, compute/maintain data and generate reports.

3. Quality Assurance

Quality Assurance supports inpatient and emergency room occurrence screening, problem tracking, offers solutions/ recommendations, provider profiling, credentialling, incident reporting, problem audit tracking, drug utilization, infection control, blood utilization review and reporting, risk management and surgical case review. Additionally, through monitoring and evaluation, the QA subsystem can gather data pertaining to the MTF's administrative procedures. It is then used to generate reports and trend analysis with respect to the quality of care.

4. Ad Hoc Reporting

Ad Hoc Reporting enables users to produce AQCESS reports in support of management and clinical research studies. It can produce very detailed reports, extract data from multiple files, compute new data from existing data, enable any data item to be ported to any deliverable form, use boolean logic selection, conduct multi-level sorting, perform computations, provide flexible report formatting, generate MUMPS code,support system security.

5. Embosser Interface

Embosser Interface supports a number of patient (input) information card embossers. The embosser produces a credit card-sized, raised letter card which is subsequently

used much like a credit card (patient information obtained from card for input into the system).

6. **Interface to the Defense Enrollment Eligibility Reporting System (DEERS)**

Interface to DEERS provides the capability to check patient eligibility at the time of admission as well as input changes/corrections to both the AQCESS and DEERS databases.

7. **Business Office**

Business Office includes cashier processing and a number of other accounting and general business/office functions. It enables users to calculate inpatient/outpatient bills, review schedule of accounts, post accounts received, display and update the rate schedule summary and issue receipts/invoices.

8. **Outpatient Encounter**

Outpatient Encounter supports outpatient clinics and provides them with the capability to schedule, cancel or scan for appointments (patient appointments that are pending and to search for available slots), process a waiting list request, create/edit a schedule, check in patients for appointments and enter registration data for new patients.

9. **Emergency Room**

Emergency Room allows users to record patient emergency room visits; produces an automated SF Form 558 (Emergency Treatment Record); produces the automated emergency

room log; and stores, online, a history of the encounter. The Emergency Room module is no longer used because of reduced administrative manpower (system seems to be too time consuming under ER conditions).

D. OPERATION

AQCESS utilizes a centralized database and displays data/information by means of a series of screens. It provides real-time information processing and generates several automated outputs on a daily and monthly basis. The terminal displays a sign-on screen on which the user enters a user ID and password. After the system validates this input, the AQCESS main menu is displayed. (If the user enters an invalid ID and/or pass-word more than a predetermined number of times, "User Entry" will lock the terminal and user ID.) The menu indicates the functions authorized to that user along with the specific functions which can be performed at that particular terminal. From the main menu, AQCESS data/information is subsequently displayed through a series of approximately 100 screens associated with each sub-menu/ selection. The number of different responses users can make to each of the displays of data entered for each patient record (must consider a number of unique combinations) can be estimated as being infinite. There are a number of recovery and error correction procedures. However, software errors which cause the user to be deleted from the system are only corrected by the Systems

corrected by the Systems Manager or technical assistants. If a user is authorized to access data via a systems function, in most cases he/she is also authorized to update the data available through that function at any time. An error will result when a user (e.g.,in admissions) attempts to update certain types of data elements (e.g.,the source of admission) because these data elements can only be updated/changed by the Systems/Corrections Manager.

As patients are registered and admitted, the user inputs demographic data and the DEERS eligibility check is performed. An embossed card is issued, if requested, and it contains input information (register/account number, patient name, family member prefix, sponsor SSN, date of birth, sex) for access to patient's record. Upon patient's release from the MTF, further data is entered by the dispositions clerk, cashiering clerk and clinical records office. The database can then provide screen or hardcopy reports on current listings of patients admitted and discharged, current inpatients, patients on convalescent leave, patients subsisting elsewhere, patients on medical hold as well as listings of inpatient or delinquent bills. Once the patient has been admitted, the data is also tracked by the Quality Assurance Coordinator until he/she is discharged.

1. System Management

System Management allows the System Manager to modify system tables (which define the valid entries for specific data fields), maintain hospital profile data, allows manager the flexibility to decide whether to assign register numbers automatically or manually, generate user ID's and passwords, assign functional privilege to users/terminals, broadcast system announcements, disable and re-enable user logon capability system-wide, control the active hours for the DEERS line, view the report queue and interrupt processing, archive records, perform system back-ups, list software error logs, load software updates and monitor disk space usage.

2. Security

Because of the sensitive nature of the data collected and reported by AQCESS, security of this data is of utmost importance. Briefly, system security is ensured by the following measures:

- Use of systems functions and access to data displays and reports are restricted to authorized users and designated terminals, as well as password.
- Data is included on reports in the form of specific codes to protect confidentiality.
- The system includes a time-out feature, causing the screen display to disappear if a terminal is left unattended past a predetermined time period.
- A privacy act statement is printed as the banner/cover page of every system report. (AQCESS User Manual, Issues 2.0, 2.2, 2.4)

E. SYSTEM BENEFITS

Generally, the overall benefits of AQCESS include:

1. automated data collection
2. real-time processing
3. easily accessible clinical information
4. manipulation/analysis of data for easy generation of reports
5. improved quality assurance monitoring
6. improved security features
7. improved system management capabilities

III. DESCRIPTION OF THE COMPOSITE HEALTH CARE SYSTEM

A. BACKGROUND

The Department of Defense (DoD) has pursued the goal of providing automated computer support to its hospitals and clinics since 1968. In February 1979, the Mission Elements Need Statement (MENS), establishing the need for an automated computer system was approved. Under the direction of the Tri-Service Medical Information System (TRIMIS) program office, stand-alone and integrated health care computer systems were acquired, implemented and operated to support Pharmacy (TRIPHARM), Laboratory (TRILAB), Radiology (TRIRAD), Appointment and Scheduling (TRIPASS), Quality Assurance (AQCESS), and Hospital Information System (HIS). The knowledge and experience gained through the operation of these systems since 1979 was used to refine and validate the system requirements for a completely new and fully integrated information system the Composite Health Care System (CHCS).

B. CHCS PURPOSE

The primary purpose of CHCS is "to provide health care services that support military forces in fulfilling their required mission...." (Draft System Decision Paper, 1989). Improving the efficiency and effectiveness of military health

care delivery during peacetime and during mobilization through integration of information resources is the goal of CHCS. The major focus of CHCS is the integration of shared information resources to resolve the deficiencies of communication, decision support, and information processing. The Composite Health Care System is designed as a fully integrated medical information system that provides automated support of information requirements for military medical treatment facilities. CHCS supports the administrative functions and the delivery of health care with information retrieval services.

C. DEPLOYMENT STATUS

CHCS is undergoing the Operational Test and Evaluation (OT&E) phase and is currently deployed to Naval Hospital Charleston as one beta-test site. The role of a beta-test site is to incrementally replace the TRIMIS systems with validated CHCS software. Continued validation of requirements and extensive evaluation of the CHCS software is conducted prior to the decision to deploy CHCS worldwide.

D. OPERATIONAL FEATURES

CHCS supports various functional areas in sharing information. Each functional area uses this information for its own purpose and communicates results/activities to other areas. Functional areas supported by CHCS include:

1. Patient Administration

Patient administration does the registration of a patient into the system. Once in the computer system, the patient's demographic information is available for access by all other modules. The patient administration module also performs the functions to admit patients to the hospital, transfer patients between wards, and discharge patients from the hospital. The creation, update and closing of inpatient records is also performed by the patient administration module.

2. Patient Appointment and Scheduling

The Patient Appointment and Scheduling module provides for a centralized appointment service, a decentralized appointment service, or a combination of both depending on the desire of the hospital. The appointment service creates and maintains the appointment schedule for the hospital. A patient is given an appointment date and time to see the health care provider creating a centralized repository of information to produce operational reports of activity.

3. Nursing

CHCS supports inpatient nursing in a variety of areas. In the area of patient care, nursing uses the system for entering and obtaining the status of all physician orders, entering patient assessment data, and generating patient care plans. Documentation of patient progress is performed in the

automated nursing notes. Nursing unit management uses CHCS to generate shift care plans, patient management reports, drug administration time reports, and staffing requirement reports. Routine administrative functions are performed by CHCS for nursing including: staff credentialling, documentation of continuing education and in-service training, and staff scheduling capabilities.

4. Laboratory

The laboratory uses the CHCS system for processing of orders for laboratory tests with automated reporting of test results. Specimens are processed, tracked, and reported through the system. All results are placed into the patients automated medical record and are immediately available for inquiry by health care providers. Automated control of blood bank operations including: blood acquisition, inventory and utilization are accomplished through CHCS. The laboratory is supported with ability to manage inventory control, register patients into the tumor registry, conduct a drug testing program, and generate a multitude of management reports.

5. Pharmacy

The pharmacy uses CHCS to process prescriptions for patients that are ordered by health care providers. The health care provider enters the prescription information at a terminal located in his office. The information is electronically transmitted to the pharmacy. The pharmacy can

immediately prepare the medication for dispensing before the patient leaves the physician's office. CHCS automatically performs checks for patient allergies, drug interactions with medications the patient is currently taking, drug dosage for the age of the patient, and records the prescription into the patient's medical record. In-patient order processing is accomplished in much the same fashion. On-line drug monographs are available for inquiry by medical staff at any terminal. Pharmacy management of inventory control and reporting are also accomplished.

6. Radiology

Orders for radiological procedures are electronically transmitted to the radiology department where the order is processed. Order tracking and results reporting are performed by the system. Radiology results are immediately available for inquiry by medical staff. Department management including inventory control is also conducted through CHCS.

7. Clinical Dietetics

The Clinical Dietetics service uses CHCS to obtain patient data needed to access the nutritional needs of the patient. This information is used to create patient diet plans, select patients of interest, patient menu selections and monitor patient nutritional data. CHCS is also used to maintain the nutrition clinic schedule and compute clinical dietetics workload data.

E. POTENTIAL BENEFITS

In general terms, the overall benefits of the CHCS system include:

1. reliable, timely, easily accessible clinical information
2. improved documentation for medicolegal issues
3. improved communication
4. improved patient satisfaction
5. improved management efficiency

IV. USER INFORMATION SATISFACTION AND ITS MEASUREMENT

A. INTRODUCTION

While the cost of hardware and telecommunications continues to decrease, the cost of software development and maintenance for "systems" is continuously rising. Organizations spend considerable amounts of time and money to create and implement useful/successful information systems. The first "hurdle" to be cleared is whether or not the system is really needed. If the need is there and the system is developed, the system's functionality must be evaluated (Is it doing what it's supposed to do?). Therefore, in addition to gauging the system by cost-benefit analysis, the effectiveness and intangible benefits of the system need to be evaluated.

B. METHODS TO ASSESS BENEFITS/EFFECTIVENESS

Several procedures have been suggested for assessing the benefits or effectiveness of an information system. Possibly due to the level of knowledge possessed by today's users, measuring user satisfaction is a common consideration in these procedures. User satisfaction is a very critical yardstick in measuring computer system success and failure. (Powers and Dickson, 1973) How can it be measured?

System usage (Swanson, 1974; Conrath and Mignen, 1990) assumes that the effectiveness of an information system can be evaluated by the amount of time the system is used. Simply, one uses an effective information system more than a less effective system. The assumption here is that the use of the system is optional to the user. If, however, the use of the system is mandatory, the correlation between use and effectiveness can no longer be made.

Others (e.g., Hamilton and Chervany, 1981) contend that effectiveness is determined by comparing performance to pre-determined objectives. To assess the effectiveness of an information system, the task objective of the system is first agreed upon. Standards are developed to measure how well the information system performs each task. Some of the problems which emerge include: objectives and measures are often not sufficiently defined; easily implemented, efficiency-oriented measures are regularly used over complex, effectiveness-oriented measures; individual or conflicting interpretations of what the objectives and corresponding data measures are, often exist.

Another frequently used procedure to determine the benefits/value of an information system is economic evaluation (cost-benefit analysis). The benefits of a system are weighed against the cost for development and operation of the system (Nolan, 1974). Although this appears objective and comprehensive on paper, in practice, cost-benefit analysis is

highly subjective and difficult to conduct (Nolan, 1974). The difficulties in using this approach for research, as argued by Ives et al. (1983), results from: (1) many costs and benefits are intangible and not easily recognized and/or converted into monetary equivalents; (2) unstructured, ad hoc decision making benefits are nearly impossible to objectively assess; (3) even when these items are determined by an organization, the data are generally unrecorded and not available for research (Ives et al., 1983).

It has been theorized that evaluation of the effectiveness or success of an information system is best accomplished through the use of decision analysis. This is based upon studies which conclude that a user will interact with a system in order to obtain assistance in the decision making process if the system is perceived to be useful in that respect. In other words, there will be resulting productivity benefits. (Nolan, 1974) An effective information system supports a user by retrieving necessary information in the proper format, yields the required level of detail, displays it at the proper frequency and lends assistance to the decision-making process. However, the decision analysis approach suffers a significant disadvantage for use in scientific research in that it is non-quantifiable and cannot be easily replicated.

C. THE USER INFORMATION SATISFACTION CONSTRUCT

The American College Encyclopedia Dictionary defines satisfaction as "the fulfillment of desires, expectations, needs or demands". Organizational Psychologist Bernard Bass (1965) generically defines satisfaction to mean ".... the extent to which the item is rewarding to us relative to how much better we might do elsewhere and what aspirations we have".

A number of researchers have concluded that measuring User Information Satisfaction (UIS) is a viable substitute for measuring system success/effectiveness. Of note, however, are two empirical studies, (Aldag and Power, 1986; Gallupe and DeSanctis, 1988). These studies were conducted to find a relationship between satisfaction and actual system performance using objective third party judges. The results of these studies are conflicting and do not support the assumption that increased satisfaction indicates actual system performance increases. Although results have been mixed, researchers continue to diligently work towards validating and standardizing UIS measures. MIS practitioners and researchers agree that the user is the best gauge for determining the success or effectiveness of an information system. (Neumann and Segev, 1980; Ives et al., 1983; Bailey and Pearson, 1983; Baroudi and Orlikowski, 1988).

The originators of the concept of UIS were Cyert and March (1963). Their research asserts that organizational behavior

continually imposes upon the manager the need for information. If a formal information system exits, the success or failure of that information system to meet the needs of the user either reinforces or frustrates the user's sense of satisfaction with that system.

A user, who presumes that required information should be readily available through careful manipulation of an information system, carries out the necessary steps to retrieve that information. If the information is indeed readily available, then satisfaction with the system is reinforced. However, if the information is not readily available, the user must modify the search beyond the information system, possibly by some other less familiar procedure. As a result, the user becomes frustrated. Moreover, an elaborate exploration through an information system involves additional time and effort, hence, a decrease in productivity. From the user's standpoint, information systems may actually hinder the user in carrying out the act of decision making (Nolan, 1965).

Successive use by the user affords him/her the opportunity to continually evaluate the system. If over a period of time, the user discovers that the information system cannot retrieve specific information without the frequent use of ad hoc means, normally a response of user dissatisfaction with the information system occurs. The project is a failure if the end product does not satisfy those it was designed to serve

(Powers and Dickson, 1973). If, however, the user reliably obtains the required/ requested information through normal operation of the information system, satisfaction with the system will be reinforced and the information system is regarded as a success.

D. THE MEASUREMENT OF USER INFORMATION SATISFACTION

User Satisfaction, as a pervasive measure of system effectiveness, has gained wide acceptance as well as many improvements along the way. (Ives and Olson, 1979; Igbaria and Nachman, 1990). Neumann and Segev (1980) establish a correlation between a user's reaction to factors having to do with satisfaction and his/ her perception of their organization's performance. Swanson (1974) empirically found a high correlation between the user's appreciation of the system and his/her usage of its outputs. Powers and Dickson (1973) concluded that user satisfaction is the most critical factor for system success. Albeit there is no standard measure of satisfaction in these studies, it is maintained that user information satisfaction is an indicator of system usage and success.

The level of user information satisfaction in the studies previously referred to is derived from a multitude of factors. Many of the users were asked to evaluate computer services in terms of their sense of satisfaction (Bailey and Pearson, 1983). The factors measured in the various studies included:

accuracy, content, frequency, timeliness, reliability, assistance, adequacy, accommodation, communication, access, appreciation and flexibility. Each of these studies used a measure that was unique to that particular study (Ives et al., 1983), nevertheless, taken as a whole, provide insight into a description of UIS.

Validation of the UIS measures in these studies is limited, especially in handling threats to internal validity (Haga and Zviran, 1990). Bailey and Pearson's (1983) model and questionnaire for measuring and analyzing UIS seemed to escape this deficiency. It was based on previous studies and provides the basis of an instrument, later refined (Ives et al., 1983), and validated (Baroudi and Orlikowski, 1988) for use. Although the method employed to measure user satisfaction by this tool is a pre-experimental design lacking pre-test/post-test or some type of control group (Campbell and Stanley, 1966), Conrath and Mignen (1990) assert that it represents a key contribution in the development of a standard instrument to measure user satisfaction.

Bailey and Pearson (1983) described a model proposed by Lawler and Wanous (1972) for measuring user satisfaction:

$$S_i = \sum_{j=1}^{i} R_{ij} W_{ij}$$

where:

R_{ij} = The reaction to factor j by the individual i
W_{ij} = The importance of factor j to individual i

Using this model, the satisfaction of the user is measured as the weighted sum of the user's positive and negative reactions against a set of information system factors (Bailey and Pearson, 1983). The user's perception of a "generically good" information system is described as one composed of factors which have previously been deemed to be most important and a system with which the user is very satisfied.

To implement the model, a review of 22 studies dealing with computer-user interface was used to establish a set of factors representing the domain of user satisfaction. (Bailey and Pearson, 1983). The initial 36 factors generated from the literature review were expanded to 39 after further review by middle managers. They deduced that the 39 factors decided upon represent the domain of user satisfaction at α=0.01. Bailey and Pearson (1983) used four bipolar adjective pairs on a seven interval scale in order for users to explain and measure their perception of each factor. (the semantic differential technique; see Figure 4.1) The seven intervals, denoted by adverbial qualifiers, incrementally ranged from negative to positive feelings or vice versa. In addition to the four adjective pairs, the user was required to test internal consistency and/or assign importance to each factor via two additional scales.

Format of Output: The material design of the layout and display of the output contents.

good :___:___:___:___:___:___:___: bad
simple :___:___:___:___:___:___:___: complex

```
          readable :___:___:___:___:___:___:___: unreadable
            useful :___:___:___:___:___:___:___: useless
To me, this factor is
         important :___:___:___:___:___:___:___: unimportant
```

Figure 4.1 Illustration of questionnaire form

Reliability coefficients of the Bailey and Pearson user information satisfaction questionnaire were determined to be very high, thus it was a reliable, valid instrument (Bailey and Pearson, 1983). It represented an important first step toward the development of a valid and useful UIS measure (Ives et al., 1983).

Deese (1979) used the Pearson questionnaire at the Federal Computer Performance Evaluation and Simulation Center. He professed, "The results identified problems that would not otherwise have been discovered" and maintained that the user satisfaction questionnaire was a very useful and worthwhile tool (Deese, 1979).

Ives, Olson and Baroudi (1983) chose to undertake an in-depth assessment of the Pearson (1983) questionnaire. By replicating the initial Bailey and Pearson study, they too, were able to reinforce the validity and reliability of the instrument. They presented several approaches to improve the quality of the original Pearson instrument.

The goal of the suggested improvements was to establish a standardized "short form" instrument. Since Pearson found that the importance scale provided no additional information,

it was eliminated from the instrument. Scales which displayed undesirable psychometric qualities were also eliminated. The number of items scaled within a question was reduced from four to two in order to reduce the time to complete the questionnaire. All of the scales in the original Pearson instrument were scored positively to the left and negatively to the right end of the scale. In order to reduce undesired outcome produced when a user simply marks down a column of responses, some of the scales were reverse scored, thereby increasing the reliability of the measure. The resulting short form was determined to substantially measure the concept of UIS that was originally proposed in the Pearson full instrument (Ives et al., 1983).

The short form measure (Ives et al., 1983) was further subjected to testing by Baroudi and Orlikowski (1988) to examine its psychometric properties. The final short form questionnaire consisted of 13 questions with two items evaluated per question (see Appendix A). Each item is scored on a seven interval scale, ranging from -3 (dissatisfied) to +3 (satisfied) with zero indicating a neutral response.

The total individual user information satisfaction score is calculated by averaging the responses of the 2 items for each question and summing the scores of the 13 questions.

$$S_i = \sum_{1}^{13} \frac{R_1 + R_2}{2}$$

where:

S_i = total individual user satisfaction
R_1 = response to the first item scale
R_2 = response to the second item scale

The range of total satisfaction can be from -39 to +39.

Three factors: electronic data processing (EDP) staff and services (Factor A), information product (Factor B), and knowledge and involvement (Factor C) were found to comprise user satisfaction using factor analysis by Ives, Olson and Baroudi (1983). These subtotals are calculated as the average of the responses to questions loading into a particular factor. Questions 1, 2, 6, 11, and 12 load heavily into the electronic data processing (EDP) staff and services factor. Questions 7, 8, 9, 10 and 13 load heavily into the information product factor. Questions 2, 3, 4, and 5 load heavily into the knowledge and involvement factor. The factor subtotals will range from -3 to +3 in value. Averages are used for meaningful comparison between the three factor scores.

Data gathered for the study came from 358 employees, mostly clerical and support personnel, of 26 New York area organizations. Construct validity was determined first by examining the relationship between each scale and the total UIS score. Factor analysis using varimax rotation converged to a three factor solution accounting for 68% of the variation in 5 iterations. This provides strong evidence of construct validity (Baroudi and Orlikowski, 1988).

Convergent validity was substantiated by comparing an interview measure of satisfaction with the instrument measure in two groups. One group of users were generally pleased and satisfied with the information system and the other group of users were generally dissatisfied. Administration of the instrument indicated a statistically significant difference by t-test in the groups at $p < .001$ (Baroudi and Orlikowski, 1988).

The total satisfaction and subtotal scores reported a reliability level above the .80 required for research. This confirms the instrument to be internally consistent and reasonably free from measurement error.

The work by Baroudi and Orlikowski (1988) and resulting short-form UIS instrument provides a reliable and valid measure of user information satisfaction. It furnishes a meaningful, standardized measure of overall satisfaction with an information system as well as specific information about satisfaction within the sub-factors of electronic data processing (EDP) staff and services, information product, and user knowledge and involvement.

V. RESEARCH METHODOLOGY

A. INTRODUCTION

The purpose of this research is to identify the characteristics of user information satisfaction (UIS) for users of the AQCESS system and compare the findings to those obtained for CHCS (Hurd, 1991). The study is based on statistical analysis of empirical data collected from AQCESS users at the Naval Hospital, Pensacola, FL and Silas B. Hays Hospital, Fort Ord, CA. The following sections will discuss the survey instrument, data collection methodology and methods of statistical analysis utilized in the study.

B. THE SURVEY INSTRUMENT

Avoiding the obstacles associated with developing a comprehensive survey questionnaire, the previously developed, psychometrically evaluated and validated short-form questionnaire of Baroudi and Orlikowski (1988) was used without alteration. A copy of the complete survey questionnaire is included in Appendix A. The questionnaire is composed of two sections: a demographical section and a user information satisfaction section.

1. **Demographic Section**

The first section of the questionnaire requested general information. Regarding questions 1-5, the respondents were asked to give their hospital division/department, job description, highest level of education, age and gender, respectively. To determine the user's experience level with the system, the sixth question asked for the length of time, in months, the respondent had used AQCESS. Further determination of the user's experience was sought in questions seven and eight. Question seven asked if the user had previously used other computer systems. If the respondent answered "yes" to question seven, he/she was asked if the previous system was a health care/hospital information system.

2. **User Information Satisfaction Section**

The second part of the survey directly addressed the issues of user information satisfaction. The instrument was designed to obtain the user's opinion on how well the AQCESS system functioned. It consisted of thirteen questions; each question having two bipolar, adjective scales for responses. Each item was to marked with an "x" in one of seven values, ranging from -3 (extremely dissatisfied) to +3 (extremely satisfied), with zero indicating a neutral response.

The questions asked can be categorized into one of three factors of user satisfaction.

Management Information Department/Information Management Division (MID/IMD) Staff: This factor is the respondent's perception of the attitude and responsiveness of the MID/IMD staff as well as their relationship with said staff. The MID/IMD staff provides only local support and act as a liaison to the Defense Medical Systems Support Center (DMSSC) which manages and administers the AQCESS program. Thus, this factor also takes into account services provided by DMSSC.

Information Product: This factor is the respondent's perception of the quality of output delivered by AQCESS.

Knowledge and Involvement: This factor is the respondent's perception of the quality of training provided, their understanding of the system, and their participation in its development/modifications.

C. SAMPLE AND DATA COLLECTION

Naval Hospital, Pensacola and Silas B. Hays Hospital, Fort Ord are two of a multitude of U.S. Navy, Army, Air Force and Coast Guard sites which operate AQCESS. The sample population then consisted of personnel from in/out-patient, clinical/technical and administration areas.

Local points of contact acted as distribution and collection agents for the surveys. The questionnaires, each accompanied with a cover letter (Appendix B), were delivered to a point of contact at each site. The points of contact

distributed 500 questionnaires at Naval Hospital, Pensacola and 200 at Silas B. Hays Hospital, Fort Ord (with return envelopes and instructions) to all department personnel within the hospital operating the AQCESS modules. The surveys were completed and returned by the respondents to the points of contact in sealed envelopes and were then forwarded to the researchers for analysis.

There were 214 questionnaires returned from Pensacola and 71 from Fort Ord, of which 174 and 58 surveys, respectively, had complete information. This represents a final return rate of 34.8% and 29%, respectively.

D. STATISTICAL ANALYSIS METHODS

Data from completed surveys were coded and entered into a spreadsheet program. The spreadsheet program was used to perform the statistical analysis. The specific procedures used in the analysis will be examined next.

1. Respondent's Satisfaction Index

Each respondent's total satisfaction index was calculated for the 13 questions using the following formula:

$$S_i = \sum_{j=1}^{13} \frac{R_{aij} + R_{bij}}{2}$$

where:

S_i = Satisfaction Index for respondent i
R_{aij} = Response to first item scale of question j for respondent i

R_{bij} = Response to second item scale of question j for respondent i

2. Total Satisfaction Index

The overall or total satisfaction index for the survey group is calculated by averaging the respondent's satisfaction index to find the mean.

3. Question Averages

The mean response to each of the thirteen questions is calculated for comparison of individual questions.

4. Factor Subtotals

The thirteen questions can be grouped into three factor subtotals, as defined by Ives, Olson, and Baroudi (1983): MID/IMD staff and services (Factor A); Information product (Factor B); and Knowledge and involvement (Factor C). The mean of the individual questions' averages is calculated to find the factor subtotals. Questions 1, 2, 6, 11, and 12 are used for the MID/IMD staff and services subtotal. Questions 7, 8, 9, 10, and 13 are used for the information product subtotal. Questions 2, 3, 4, and 5 are used for the knowledge and involvement subtotal.

5. Comparison of Groups

The respondents were categorized by the type of use of the AQCESS system. Three work groups were identified: (1) Physicians; (2) Ancillary; and (3) Administration. The individual questions' averages, total satisfaction indexes, and sub-factor totals were compared for one group verses the

combination of the other two groups using a t-test with the significance level of alpha = 0.05. The t-test is used to determine if there is a significant difference between the arithmetic mean value of two groups.

VI. DESCRIPTIVE FINDINGS (NAVAL HOSPITAL, PENSACOLA)

A. DEMOGRAPHIC FINDINGS

Of the 174 respondents, 76 were male and 98 were female. The age of the respondents ranged from 19 to 77 with a mean of 36 years old.

1. Work Center Distribution

The hospital department work centers reported were in/out-patient areas including: administration (ie; Appointment and Scheduling, Medical Service Accounting, Emergency Room and Quality Improvement), clinics (ie; Physical Therapy, OB/GYN, Pediatrics, etc.), laboratory (ie; Radiology, Pathology, etc.) and other departments. Figure 6.1 reflects the distribution by work center.

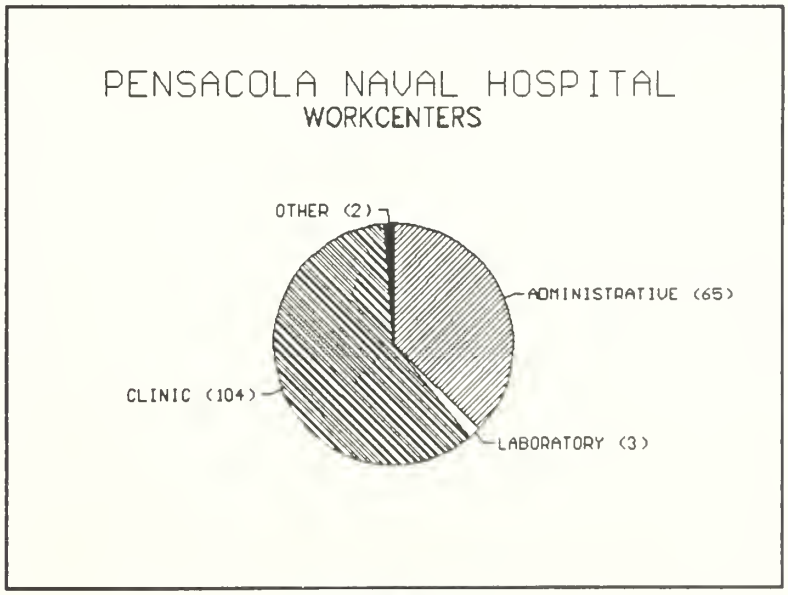


Figure 6.1

2. **Job Description Distribution**

The job descriptions reported are from a multitude of specific functions but can be categorized as:

1. Technician - a hospital corpsman functioning in a medical-technical capacity (pharmacy technician, laboratory technician, clinic corpsman)
2. Physician - a medical doctor
3. Health Professional - a licensed medical professional other than a physician (nurse, pharmacist, physical therapist, bio-medical officer)
4. Other - a person not listed above (hospital administration non-medical clinic staff)

Figure 6.2 reflects the sample distribution by job description.

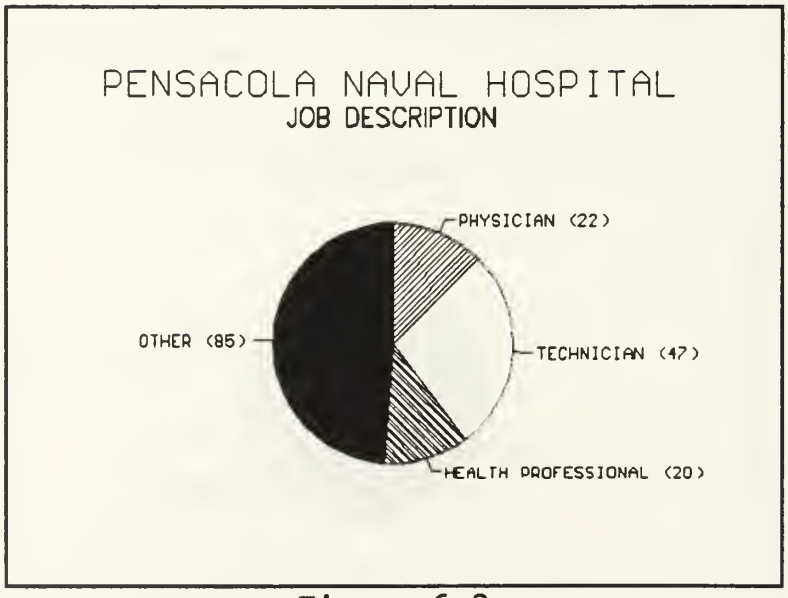


Figure 6.2

3. Work Group Distribution

For the purposes of this investigation, the study population was segregated according to the assumed primary use of the computer system. The categories provide a clear separation of work groups from an organizational and cultural standpoint. These groups are used extensively throughout the study.

1. Administrative - use of the system for indirect medical purposes (patient registration, appointment scheduling and administrative reporting)
2. Ancillary - use of the system for direct medical support (prescription filling, laboratory specimen processing)
3. Physician - use of the system by physicians (accessing patient historical data, performance reports)

Figure 6.3 represents the distribution of respondents according to their main use of the system.

4. Education Distribution

The level of education reported by the respondents represents a well educated user population. A little more than 79 percent of the users have had at least some college education with nearly 31 percent having completed a Bachelor,

Master, Medical or PhD degree. Figure 6.4 represents the breakdown by education.

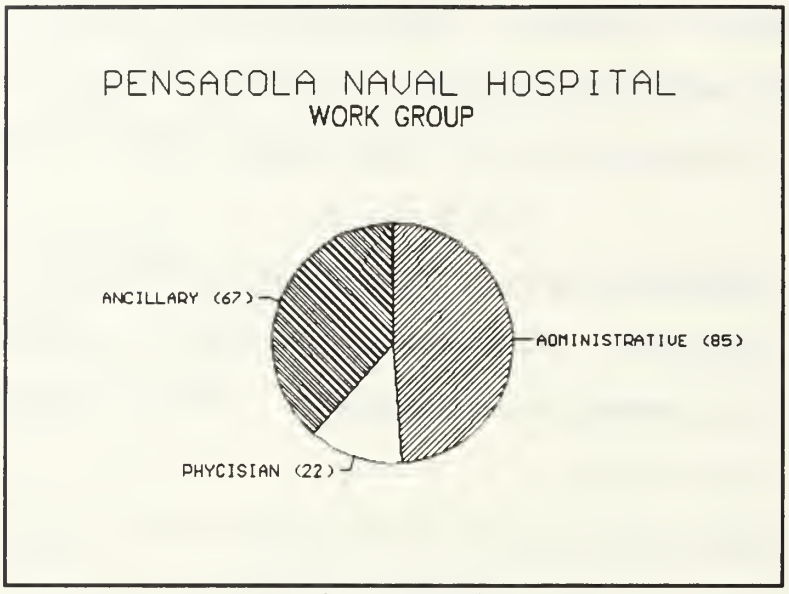


Figure 6.3

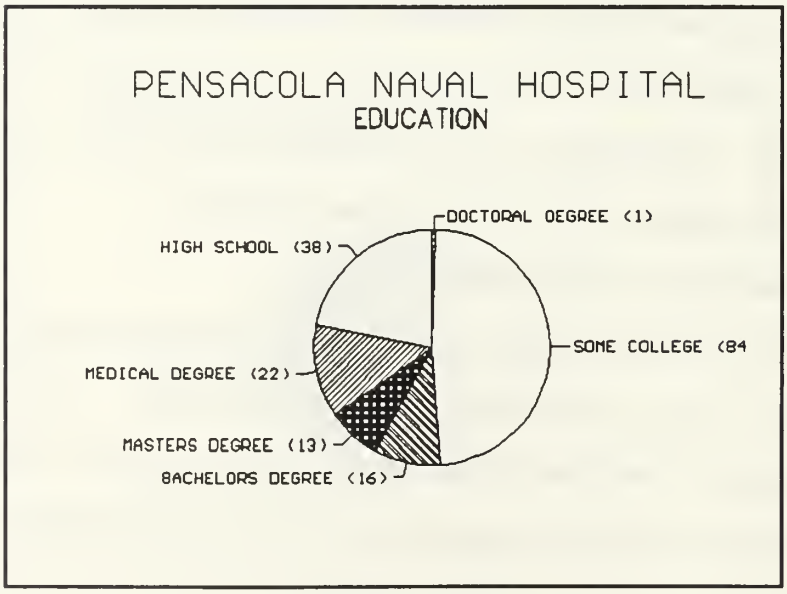


Figure 6.4

B. COMPUTER SYSTEM USE

The length of time the respondents reported as having used the AQCESS computer system ranged from one to 72 months with a mean of 21 months. Of the 174 respondents, 63 had used a computer system previously. 58 of the 63 users had used a health care information system before using AQCESS. Although many of the respondents had experience with computers, this was the first exposure to a health care information system for 67 percent of the users.

C. SATISFACTION FINDINGS

The survey results for user satisfaction are compared for the three work groups in three areas: 1) overall satisfaction, 2) responses to individual questions, 3) three group factors: MID staff and services; information product; knowledge and involvement. The actual values of responses to individual questions reported in the survey may be significant in themselves. However, the relative scores are useful for comparison among various work groups, organizations and information systems. (Baroudi and Orlikowski, 1988) The administrative group composes nearly 48 percent of the survey population, the ancillary group composes 40 percent and the remainder consists of physicians.

1. Overall Satisfaction (Pensacola)

The overall satisfaction was determined by the mean of the sum of the 174 survey responses to the thirteen survey questions from the work groups at Pensacola. The mean overall satisfaction index of the combined work groups was 11.16 on a scale ranging from -39 to +39. Figure 6.5 illustrates a comparison of the overall satisfaction index of the work groups at Pensacola. The survey shows that the administrative group displays the highest overall satisfaction (13.81), closely followed by ancillary (13.73), with physicians registering the least overall satisfaction (-4.16). Using a t-test, the level of satisfaction for physicians was statistically significant lower at alpha = 0.05 than remaining groups.

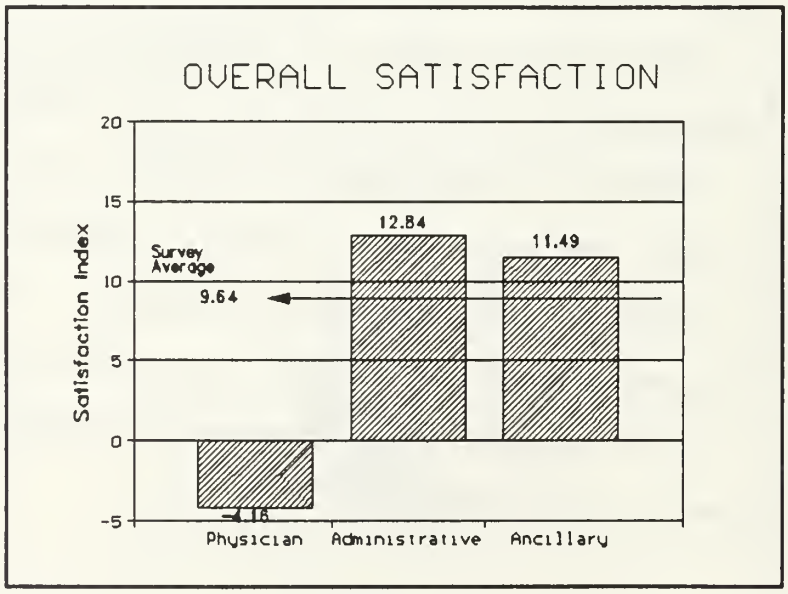


Figure 6.5

2. Individual Questions

The 13 questions on the survey requires two responses from the respondent. A number of the response scales are reverse scored to nullify the effects of a respondent who simply marks down one column of the questionnaire (Baroudi and Orlikowski, 1988). Figure 6.6 displays the average level of satisfaction for each question, by work group, for Pensacola.

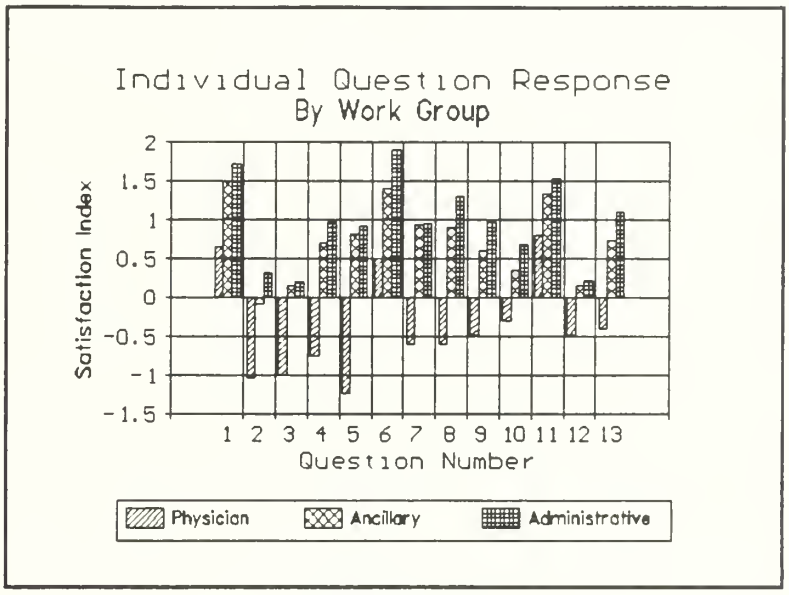


Figure 6.6

It is easily discernable that some questions exhibit a relatively high or low level of satisfaction when compared to the other questions. Questions 1, 6 and 11 indicate a high level of user satisfaction. These questions deal with issues concerning the Management Information Department (MID) staff. However, questions 2, 3 and 12 stand out as exhibiting a relatively low satisfaction index. Questions 2 and 12 are

concerned with software development/modification and question 3, training. The following discussion will examine each question by work group.

Figure 6.7 illustrates Pensacola physician's responses to individual questions as they compare to the remainder of the survey group. Figure 6.8 represents the ancillary group's responses as compared to the remainder of the survey groups. Figure 6.9 is the administrative group's responses as compared to the remainder of the survey groups.

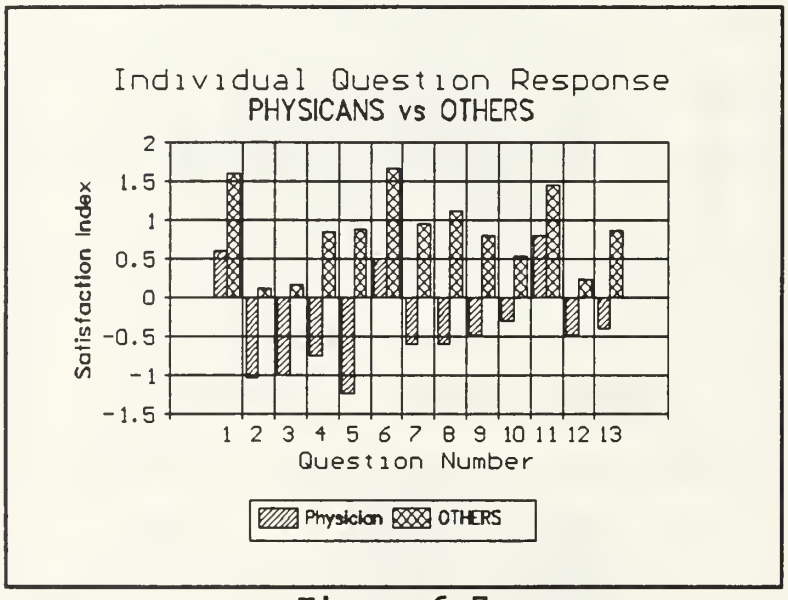


Figure 6.7

a. Question 1 - Relationship with the Management Information Department (MID) Staff

This question measures the relationship between users and the Management Information Department. The level of

satisfaction towards the MID staff is relatively high. It has the highest satisfaction index. The administrative group showed the highest level of satisfaction of the three groups. The ancillary group was slightly lower. The physicians revealed a statistically significant lower difference at alpha = 0.05.

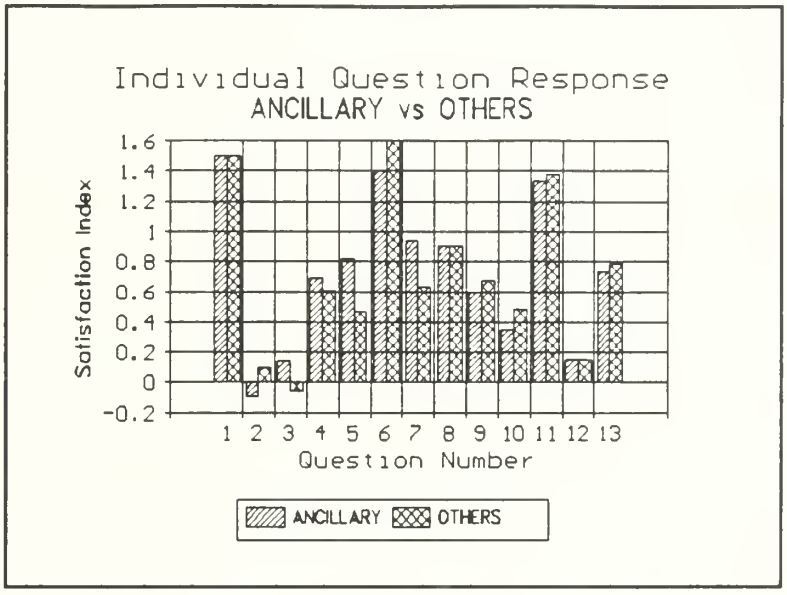


Figure 6.8

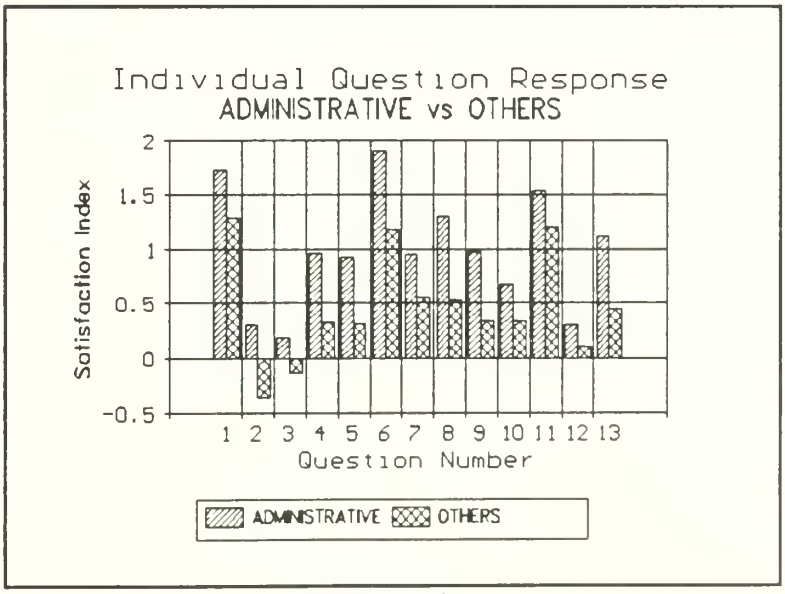


Figure 6.9

b. Question 2 - Processing of Requests for Changes to Existing Systems

This question is concerned with the length of time required and/or timeliness of changes to AQCESS. This was the lowest scoring question which indicates a user perceived problem. Physicians were the least satisfied with a statistically significant lower difference at alpha = 0.05. The administrative users displayed a statistically significant higher difference at alpha = 0.05.

c. Question 3 - Degree of Training Provided to Users

The response to this question indicates the user's perceived level of training to use the system. The level of satisfaction of the administrative and ancillary groups was nearly equal. The physicians, however, showed a statistically significant lower difference at alpha = 0.05.

d. Question 4 - User's Understanding of the System

The response to this question is the respondent's self-reported assessment of his/her ability to interact with the system. Physicians were statistically significant lower at alpha = 0.05. Whereas, the administrative group showed a statistically significant higher difference at alpha = 0.05. The ancillary group indicated they were substantially less satisfied with the amount of training they received (question 2) as compared to their understanding of the system.

e. Question 5 - User's Feeling of Participation

The responses to this question yield a measurement of the user's perception of participation in the system. The administrative group had a statistically significant higher perception of participation than the other groups. Conversely, physicians had a statistically significant lower difference at alpha = 0.05. The ancillary group's feeling of participation was slightly lower than the administrative, but not statistically significant.

f. Question 6 - Attitude of the Management Information Department (MID) Staff

The intent of this question is to gauge the user's perception of the attitude of the MID staff. In particular, the staff's attitude towards rendering services. The response to this question was positive for all three groups. The administrative group was statistically significant higher while the physicians were statistically significant lower at alpha = 0.05. However, this question ranked third among the physician's positive responses.

g. Question 7 - Reliability of Output Information

The user's response to this question indicates his/her view of consistency and dependability of the output information. Administrative and ancillary groups responses were positive and approximately the same. Physicians' response was statistically significant lower at alpha = 0.05.

h. Question 8 - Relevancy of Output Information (to intended function)

This question measures the degree of compatibility between what the user wants or requires and what is provided by the information products and services. Administrative group showed a statistically significant higher difference at alpha = 0.05. The physicians, however, displayed a statistically significant lower difference at alpha = 0.05. The ancillary group was slightly lower than the administrative group with no statistical significance.

i. Question 9 - Accuracy of Output Information

The user's opinion of correctness of the output information is captured by this question. Administrative group was statistically significant higher while physicians were statistically significant lower. Ancillary was not statistically significant, but was equally satisfied as the administrative group.

j. Question 10 - Precision of Output Information

Precision of output information is the variability of output information from that which it purports to measure. The administrative and ancillary groups were not statistically significant, but the administrative group's response was approximately twice that of the ancillary group's. The physicians had a statistically significant lower difference at alpha = 0.05.

k. Question 11 - Communication with the Management Information Department (MID) Staff

The response to this question is a basis for determining user perception of the manner and methods of information exchange between users and the MID staff. The results for the administrative and ancillary groups were not statistically significant, but instead, the scores were nearly even. Physicians did, however, show a statistically significant lower difference at alpha = 0.05.

l. Question 12 - Time Required for New Systems Development

This question is designed to assess the user's perception of the elapsed time between his/her requests for new applications and the design, development and the implementation of the application systems by the contractor or outside service representative. The administrative and ancillary groups were nearly neutral. The physicians, however displayed a statistically significant lower difference at alpha = 0.05.

m. Question 13 - Completeness of Output

The response to this question was intended to help measure the user's impression of the comprehensiveness of the content of the output information. The administrative group were statistically significant difference higher, while the

physicians were statistically significantly lower at alpha = 0.05.

3. **Grouped Factors**

The original user's information satisfaction survey instrument sub-divided the thirteen questions into three grouped factors. These factors are designated as EDP (MID/IMD) staff and services, information system product, and knowledge and involvement. (Ives, Olson and Baroudi,1988) The three factors are calculated from the averages of the component questions. MID staff and services (Factor A) is sub-divided into two separate components: local MID staff functions (MID) and contractor or Defense Medical Systems Support Center (DMSSC) functions (Con). Factor A (MID) is derived from questions 1, 6,and 11; Factor A (Con) from questions 2 and 12; information system product (Factor B) from questions 7, 8, 9, 10 and 13; and knowledge and involvement (Factor C) from questions 2, 3, 4, and 5 (Hurd,1991).

The administrative group's and physicians' level of satisfaction were statistically different at significance level alpha = 0.05. The administrative group was the most satisfied and the physicians were the least satisfied of all the groups. Figure 6.10 represents the work groups' level of satisfaction with relation to sub-total factors. Figure 6.11 represents factor satisfaction of physicians compared to the other work groups.

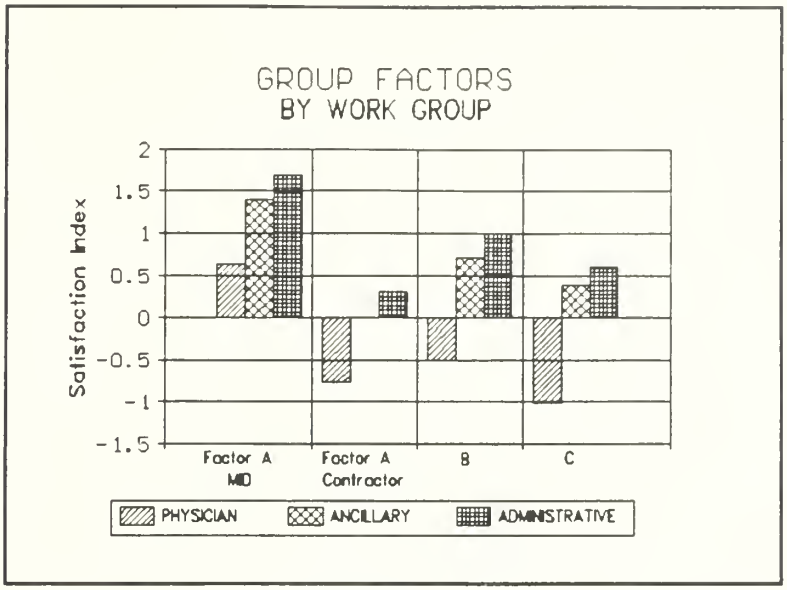


Figure 6.10

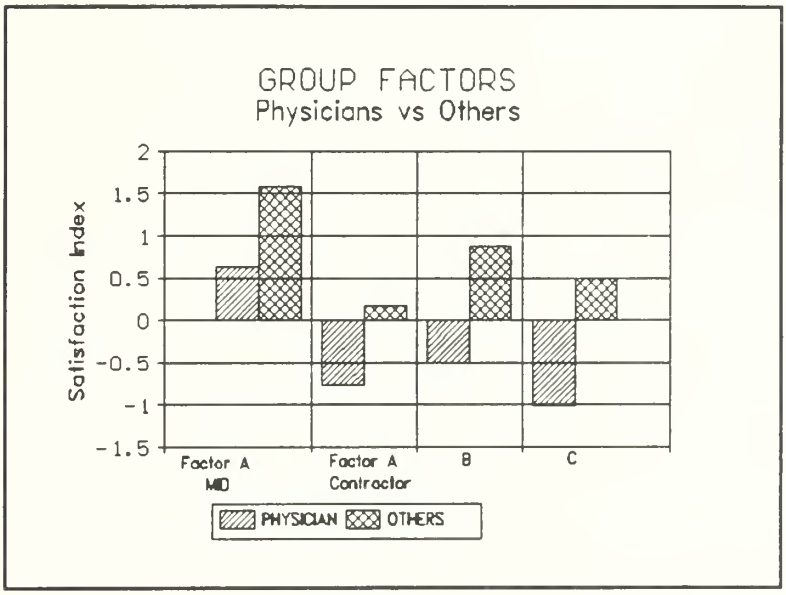


Figure 6.11

Figure 6.12 represents factor satisfaction of ancillary personnel compared to the other work groups.

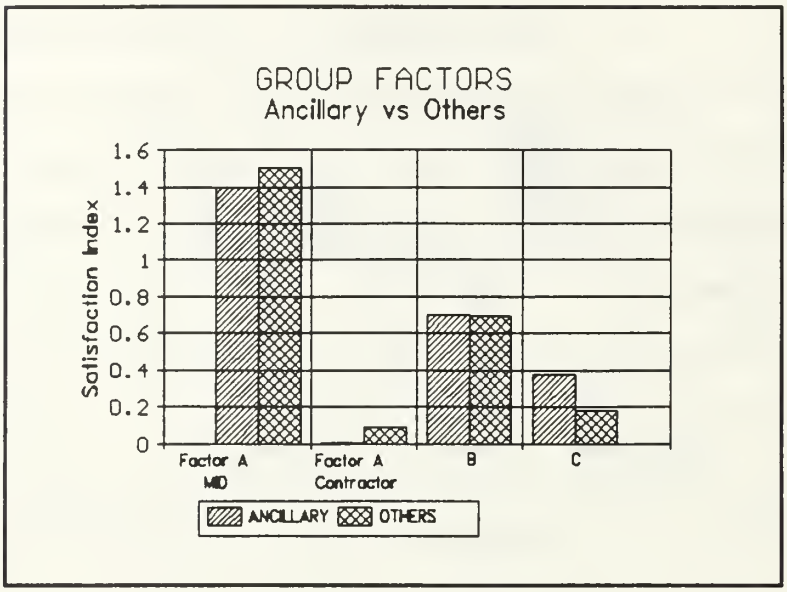


Figure 6.12

Figure 6.13 represents factor satisfaction of administrative personnel compared to the other work groups.

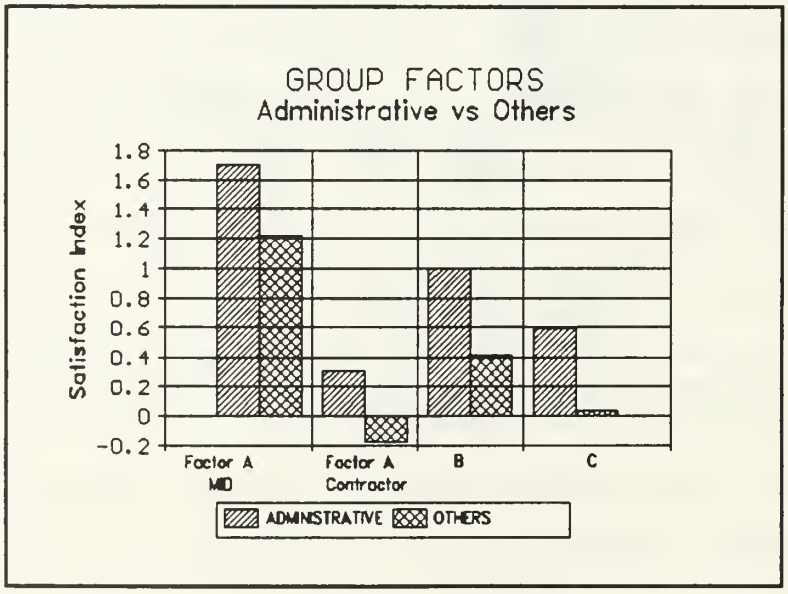


Figure 6.13

Figure 6.14 represents the group factor satisfaction indices of administrative personnel compared to ancillary personnel.

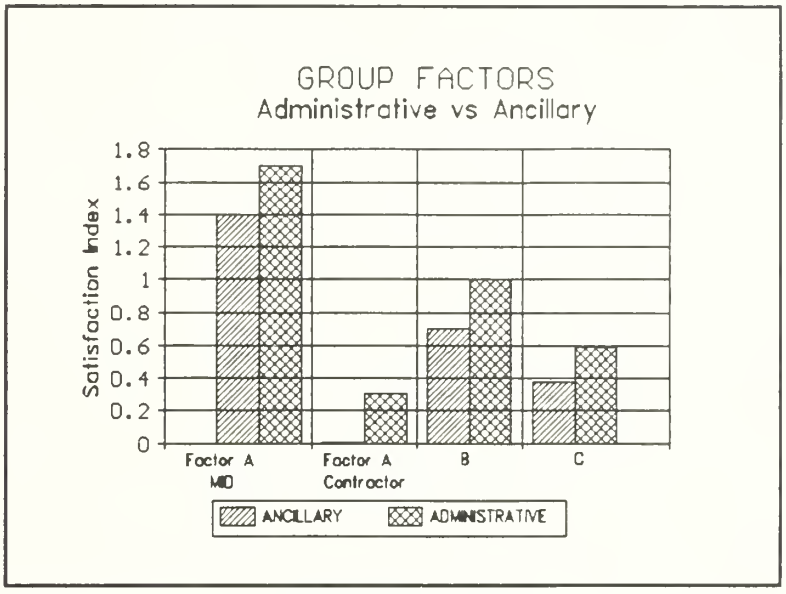


Figure 6.14

a. Factor A (Local MID Staff and Services)

This factor is the respondent's self-reported assessment of the attitude and responsiveness of the local MID staff and the services they provide, as well as, the quality of the relationship with the MID personnel (Baroudi and Orlikowski). As seen in Figure 6.10, the administrative personnel displayed the highest level of satisfaction with a statistically significant difference at alpha = 0.05. The lowest level of satisfaction was displayed by the physicians, however, it is exceptionally high in comparison with their

responses to the other factors. The physicians were statistically significant at alpha = 0.05.

b. Factor A (Contractor, DMSSC)

This factor represents the responsiveness and services of outside software programmers and management. It received the lowest level of satisfaction of any factor. All work groups rated this factor extremely low, with administrative personnel recording the highest level of satisfaction and the physicians scoring the lowest level of satisfaction. The administrative group showed a statistically significant higher difference while the physicians showed a statistically significant lower difference at alpha = 0.05.

c. Factor B - Information Product

This factor represents the users perception of the quality of output delivered by the information system (Baroudi and Orlikowski, 1988). The administrative group scored the highest level of satisfaction with a statistically significant difference at alpha = 0.05. The physicians recorded the lowest level of satisfaction with a statistically significant difference at alpha = 0.05.

d. Factor C - Knowledge and Involvement

This factor represents the respondents' self-reported assessment of the quality of training provided, their understanding of the system, and their participation in its development (Baroudi and Orlikowski, 1988). There was a

statistically significant difference between the level of satisfaction of the administrative group and the physicians at alpha = 0.05. The administrative group and ancillary group rated the satisfaction level nearly the same. The physicians scored this factor the lowest of all the group factors.

4. Time of System Use

Igbaria and Nachman (1990) found that users with better computer background are likely to be more confident in their ability to use the information system and more satisfied with experience. Generally, users become more skilled with an information system over time. Therefore, the assumption is that the respondents who use the system the longest will be more experienced and record a greater level of satisfaction.

The respondents were separated into subgroups of users with less than six months, six months to 11 months, and greater than 11 months experience. Almost sixty percent of the respondents had 11 months or greater experience with the AQCESS system. Figure 6.15 represents the breakdown of respondents by time of system use.

The respondents who used the system more than or equal to 11 months generated the lowest level of user satisfaction. Conversely, the respondents with 6 to 11 months of system use recorded the highest level of satisfaction with the system. Regression analysis indicated no correlation ($r < 0.02$)

between the time of system use and level of user satisfaction with the system for any factor.

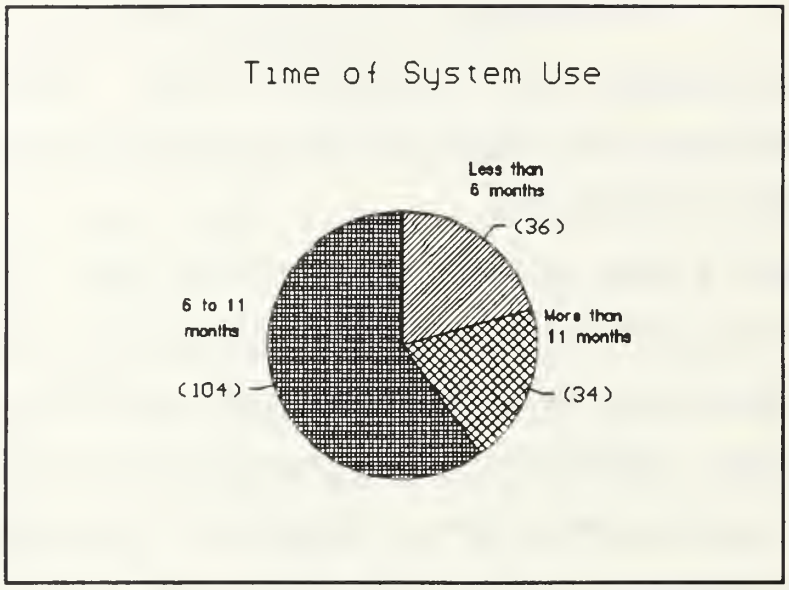


Figure 6.15

Figure 6.16 shows the level of satisfaction with AQCESS verses time of system use.

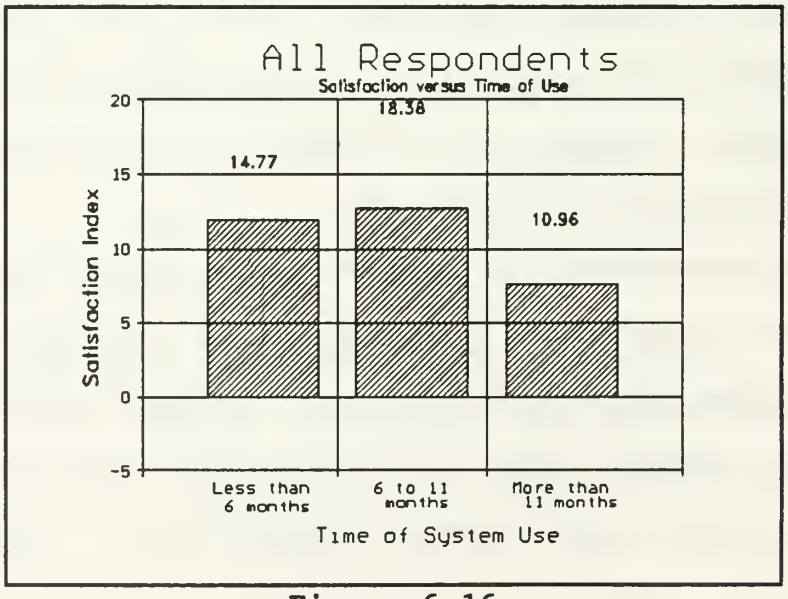


Figure 6.16

Breaking the work groups down by time of system use, there was still no correlation between time of system use and level of satisfaction of any factor by regression analysis. The following discussion will describe the level of user satisfaction for the work groups over time.

The physicians with less than six months system use had a satisfaction index of 2.625. Unlike the ancillary and administrative groups, the physicians' level of satisfaction decreased to -3.25 between six to 11 months experience. The level of satisfaction for the physicians with more than 11 months experience show a decrease at -6.36, a downward trend consistent with the other work groups. Figure 6.17 illustrates the physician's level of satisfaction with respect to time of system use.

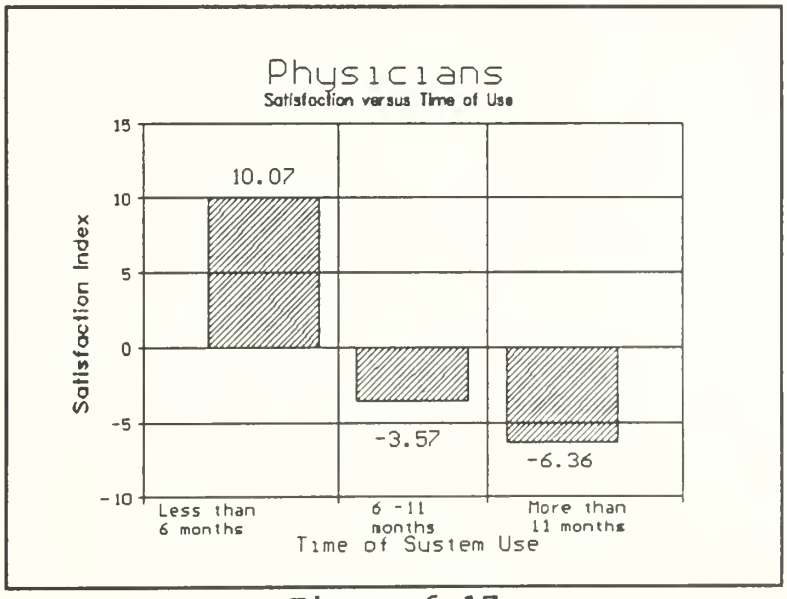


Figure 6.17

The ancillary group's level of satisfaction displays a similar trend to the administrative group. The satisfaction index for users with less than six months experience was slightly lower (18.17) than users with six to 11 months experience whose level of satisfaction rose to 19.8. Surprisingly, the level of satisfaction for users with more than 11 months of experience drops dramatically to 9.4. Figure 6.18 illustrates the ancillary group's level of satisfaction with respect to time of system use.

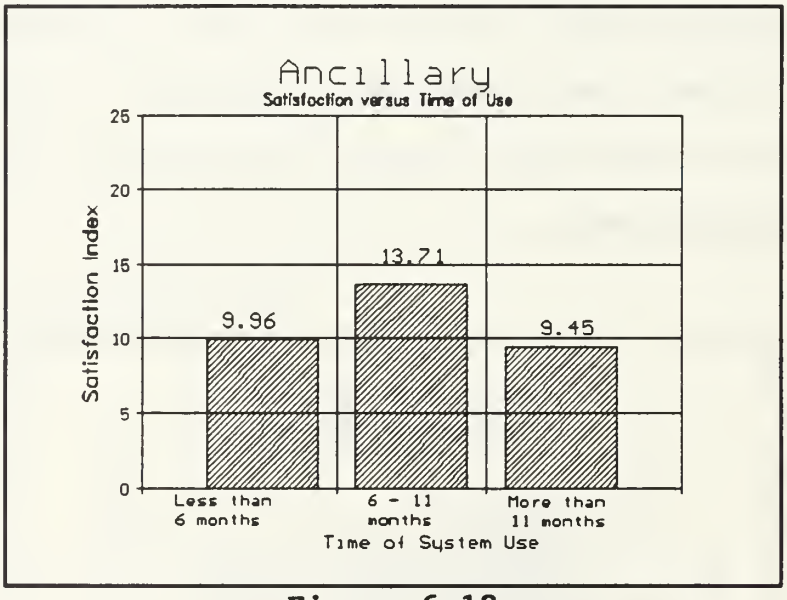


Figure 6.18

Although the trends for both the administrative and the ancillary group's level of satisfaction are nearly the same, the administrative group's level of satisfaction amongst the user subgroups is more pronounced. The satisfaction index for users with less than six months experience was lower at

15.6 than users with six to 11 months experience whose level of satisfaction rises steeply to 22.35. The level of satisfaction for users with more than 11 months of experience drops sharply to 9.4. Figure 6.19 illustrates the administrative group's level of satisfaction with respect to time of system use.

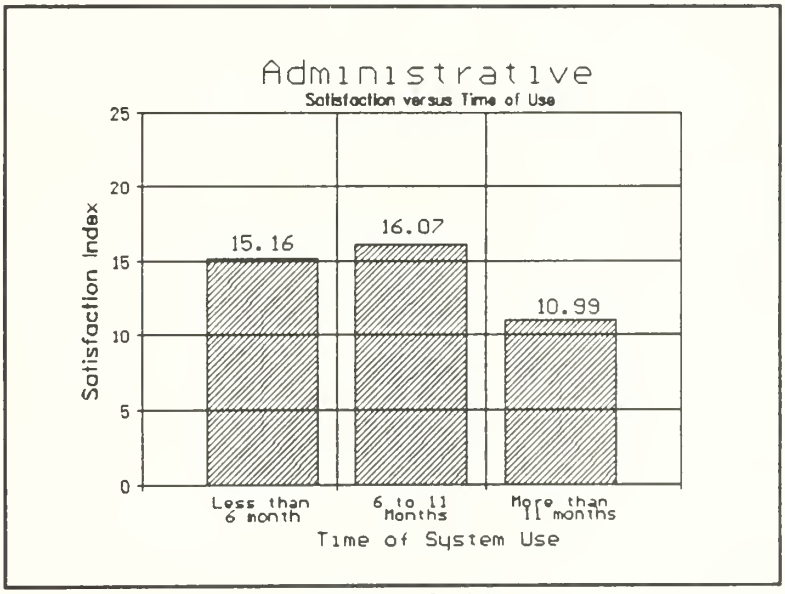


Figure 6.19

VII. DESCRIPTIVE FINDINGS (SILAS B. HAYS HOSPITAL, FORT ORD)

A. DEMOGRAPHIC FINDINGS

Of the 57 respondents, 10 were male and 47 were female. The age of the respondents ranged from 19 to 65 with a mean of 34 years old.

1. Work Center Distribution

The hospital department work centers reported were in/out-patient areas including: other (ie; Patient Administration Division, Quality Assurance, etc.) and clinics (ie; OB/GYN, Pediatrics, etc.). Figure 7.1 reflects the distribution by work center.

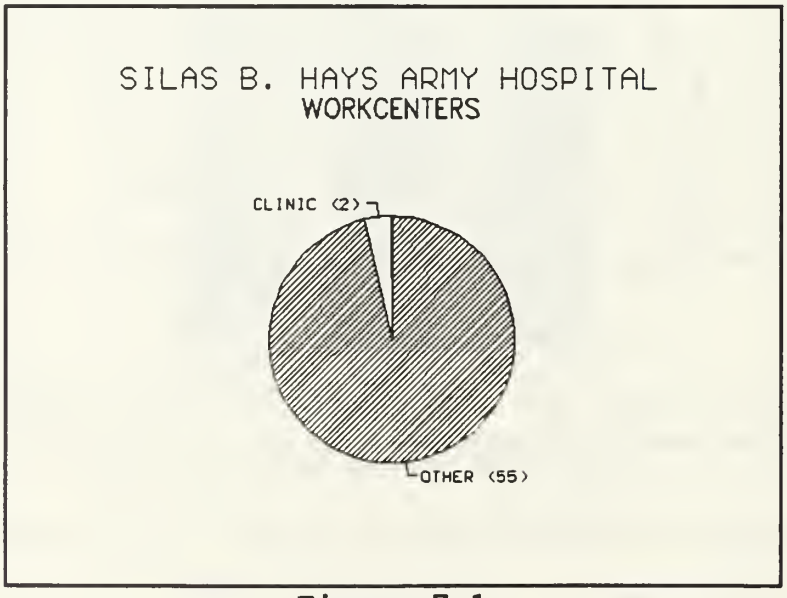


Figure 7.1

2. Job Description Distribution

The job descriptions reported are from a multitude of specific functions but can be categorized as:

1. Technician - a hospital specialist functioning in a medical-technical capacity (laboratory technician, clinical technician, medic)
2. Other - a person not listed above (hospital administration non-medical clinic staff)

Figure 7.2 reflects the distribution by job description.

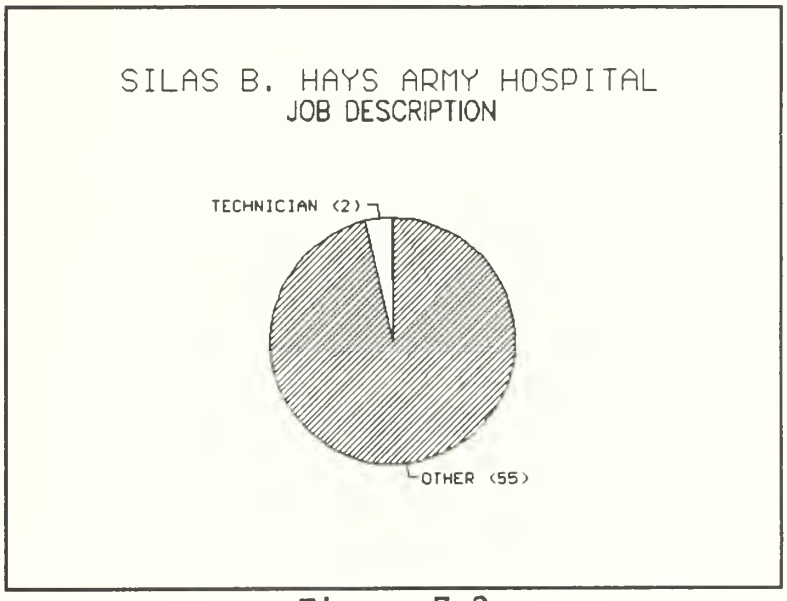


Figure 7.2

3. Work Group Distribution

For the purposes of this investigation, the study population was segregated according to the assumed primary use of the computer system. The categories provide a clear

separation of work groups from an organizational standpoint. These groups are used extensively throughout the study of the Silas B. Hays Hospital sample (Fort Ord).

1. Administrative - use of the system for indirect medical purposes (patient registration, appointment scheduling and administrative reporting)
2. Ancillary - use of the system for direct medical support (prescription filling, laboratory specimen processing)

Figure 7.3 represents the population of users/respondents according to their main use of the system.

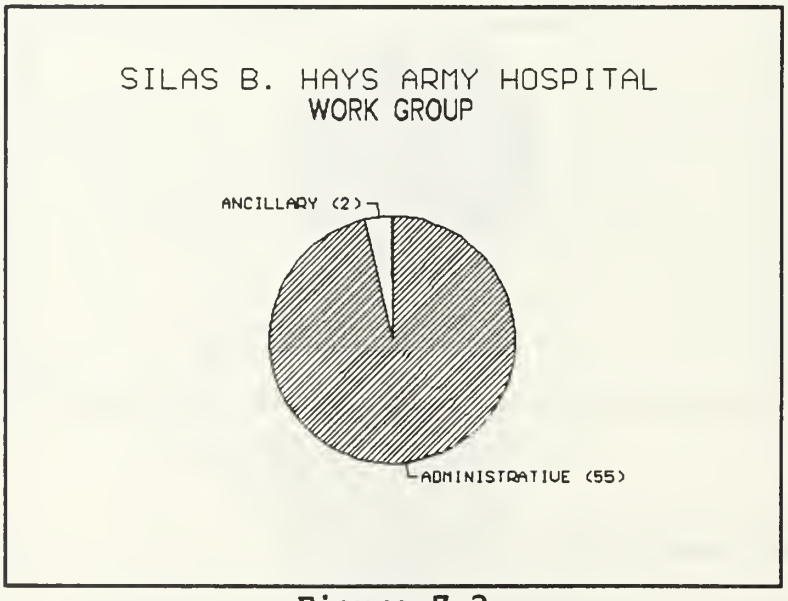


Figure 7.3

4. Education Distribution

The level of education reported by the users represents a fairly well educated user population. Approximately 67 percent of the users have at least had some college education. 12 percent completed a Bachelors or Masters degree with 5 percent having worked on a Masters degree. Figure 7.4 represents the breakdown by education.

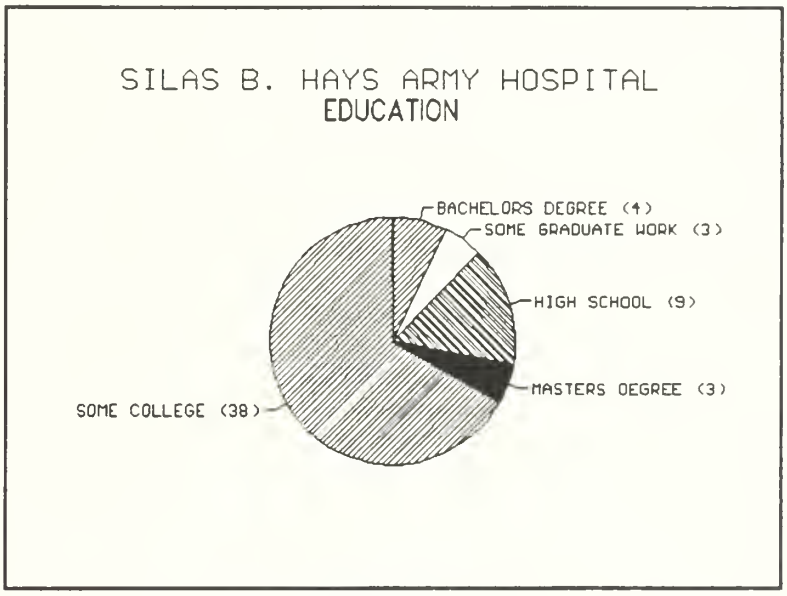


Figure 7.4

B. COMPUTER SYSTEM USE

The length of time users reported as having used the AQCESS computer system ranged from one month to 72 months with a mean of 19.4 months. Of the 57 respondents, 22 had used a computer system previously. 16 of the 57 users had used a health care information system before using AQCESS. Although

many of the respondents had experience with computers, this was the first exposure to a health care information system for 72 percent of the users.

C. SATISFACTION FINDINGS

The survey results for user satisfaction are compared for the two work groups in three areas: 1) overall satisfaction, 2) responses to individual questions, 3) three group factors: Information Management Division (IMD) staff and services; information system product; knowledge and involvement. The actual values of responses to individual questions reported in the survey may be significant in themselves. However, the relative scores are useful for comparison among various work groups, organizations and information systems. (Baroudi and Orlikowski, 1988) The administrative group composes nearly 97 percent of the survey population and the remainder consists of the ancillary group.

1. Overall Satisfaction (Fort Ord)

Overall satisfaction is measured by the mean of the sum of the responses to the survey questions. The mean survey score index was 10.47 on a scale ranging from -39 to +39. Figure 7.5 presents a comparison of the overall satisfaction index of both groups and the overall mean satisfaction. The survey shows that the ancillary group displays the highest overall satisfaction index (13.0), with the administrative group recording the lower overall satisfaction (10.38). Using

a t-test, there was no significant difference between the ancillary group and the administrative group at alpha = 0.05.

2. Individual Questions

The 13 questions on the survey require two responses each from the respondent. A number of the response scales are reverse scored to nullify the effects of a respondent who simply marks down one column of the questionnaire (Baroudi and Orlikowski, 1988). Figure 7.6 shows the average level of satisfaction for individual questions by work group.

Similar to the results discussed in chapter six, questions 1, 6 and 11 indicate a high level of user satisfaction. These questions deal with issues concerning the IMD staff. However, questions 2, 3 and 12 stand out as exhibiting a relatively low satisfaction index. Questions 2 and 12 are concerned with DMSSC services and modifications and question 3, training. The following discussion will examine each question by work group.

a. Question 1 - Relationship with the Information Management Division (IMD) Staff

As noted earlier, the level of satisfaction towards the IMD staff is relatively high. Although not statistically significant at alpha = 0.05, the ancillary group showed the higher level of satisfaction between the two groups.

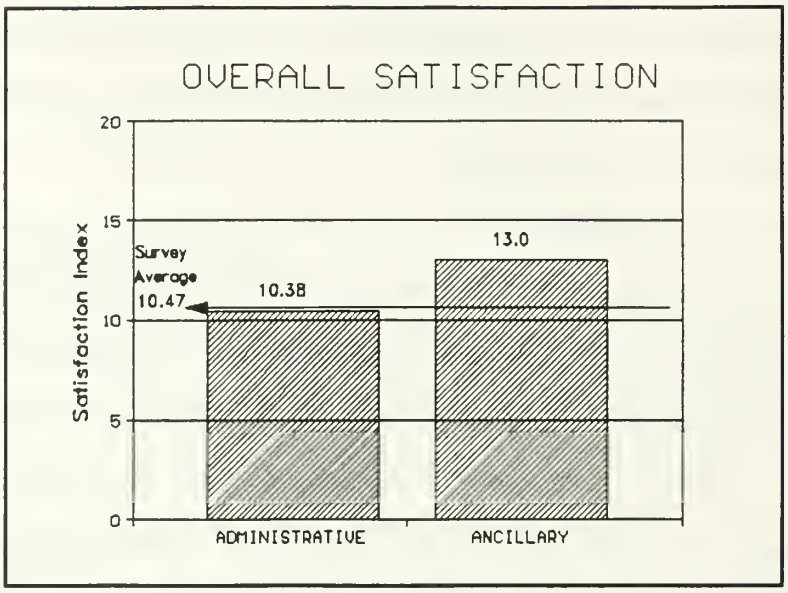


Figure 7.5

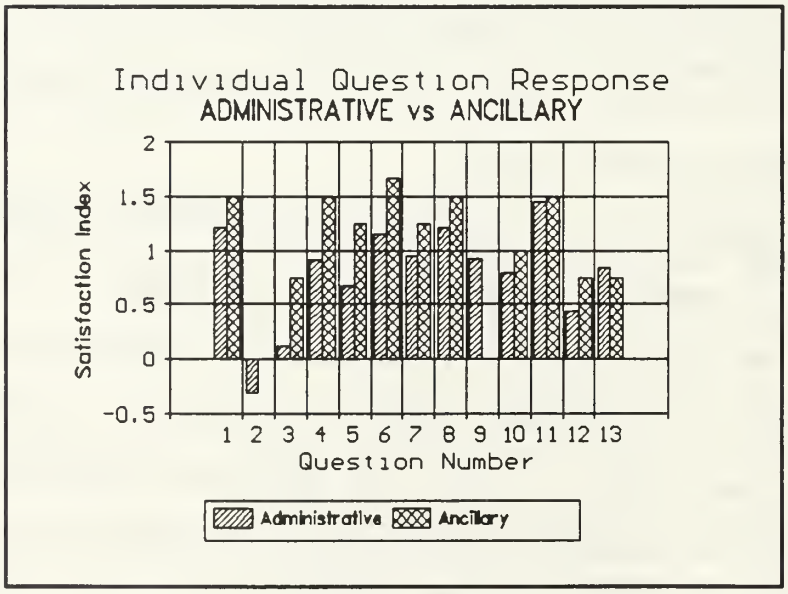


Figure 7.6

b. Question 2 - Processing of Requests for Changes to Existing Systems

This question received the lowest satisfaction index rating. The response was neutral for the ancillary group and negative for the administrative group. A t-test indicated no statistically significant differences at alpha = 0.05.

c. Question 3 - Degree of Training Provided to Users

The level of satisfaction for the ancillary group was higher than that of the administrative group but not statistically significant difference higher at alpha = 0.05.

d. Question 4 - User's Understanding of the System

There was no statistically significant difference between the administrative and ancillary groups at alpha = 0.05. Again, the ancillary group displayed a higher satisfaction index.

e. Question 5 - User's Feeling of Participation

In response to this question, the administrative and the ancillary groups responded positively with no statistically significant difference at alpha = 0.05.

f. Question 6 - Attitude of the Information Management Division (IMD) Staff

The response to this question (the second highest rated question) was favorable with no statistically significant difference at alpha = 0.05.

g. Question 7 - Reliability of Output Information

The responses were similar with no statistically significant differences between the groups.

h. Question 8 - Relevancy of Output Information (to intended function)

Both groups responded comparably without statistically significant differences.

i. Question 9 - Accuracy of Output Information

The ancillary group was neutral regarding this item. The administrative group was slightly more positive, but there were no statistically significant differences at alpha = 0.05.

j. Question 10 - Precision of Output Information

The response by both groups was somewhat favorable with the administrative group's satisfaction index being a little higher. There were, however, no statistically significant differences.

k. Question 11 - Communication with the Information Management Division (IMD) Staff

All questions concerning the IMD staff received high satisfaction levels from both groups (highest rated question response). Neither of the groups' responses were statistically different by t-test at alpha = 0.05.

l. Question 12 - Time Required for New Systems Development

The groups were nearly neutral regarding this issue. There were no statistically significant differences at alpha = 0.05.

m. Question 13 - Completeness of Output

Both groups responded similarly with no statistically significant differences at alpha = 0.05.

3. **Grouped Factors**

As discussed in chapter VI, the questions are grouped into three factors that comprise user satisfaction. These factors: IMD staff and services, information system product, and knowledge and involvement, are calculated through averages of the component questions. IMD staff and services (Factor A) is sub-divided into two separate components: local IMD staff functions (IMD) and contractor/DMSSC functions (CON).

Neither of the work groups' satisfaction level for any of the factors were statistically different at significance level alpha = 0.05. Figure 7.7 represents the ancillary and administrative groups' level of satisfaction in relation to the group factors.

a. Factor A (Local MID Staff and Services)

In Figure 7.7, the ancillary group displayed the highest level of satisfaction but it was not statistically

significant different from the administrative group at alpha = 0.05.

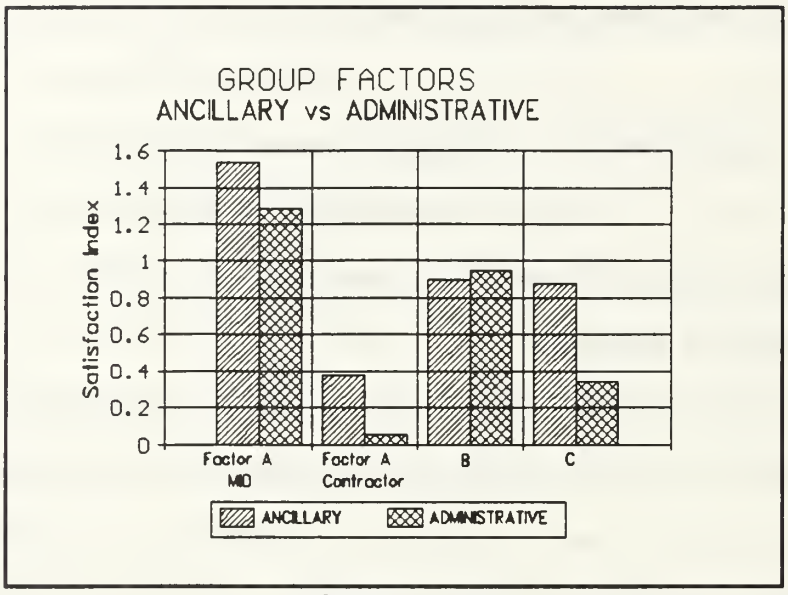


Figure 7.7

b. Factor A (Contractor Services)

This factor received the highest level of satisfaction of any factor. The ancillary group was not statistically significant different from the administrative group at alpha = 0.05.

c. Factor B - Information Product

This factor is the second highest rated of the four and there is no statistically significant difference between the ancillary and administrative groups at alpha = 0.05.

d. Factor C - Knowledge and Involvement

This factor showed no statistically significant difference between the level of satisfaction for the ancillary or administrative groups.

4. Time of System Use

As stated in chapter VI, it is expected that the more experienced users will exhibit a greater level of satisfaction.

Figure 7.8 displays the separation of users into subgroups having less than six months experience, six to 11 months, and greater than 11 months.

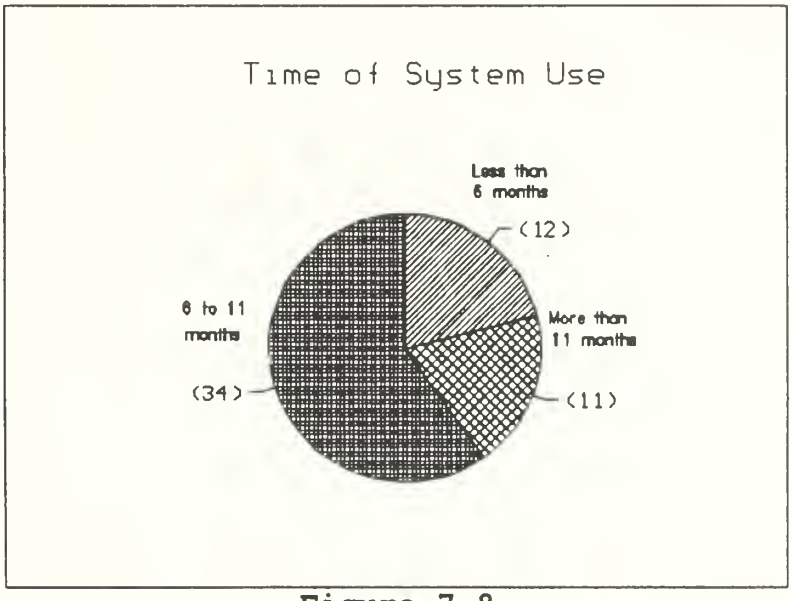


Figure 7.8

The ancillary group had no users with less than six months nor greater than 11 months of system use. Therefore

there is really no trend to report for this group. However, it is worthy to note that the two respondents displayed a high level of satisfaction with an index of 13.0. Figure 7.9 depicts the ancillary users' satisfaction index versus the time of system use.

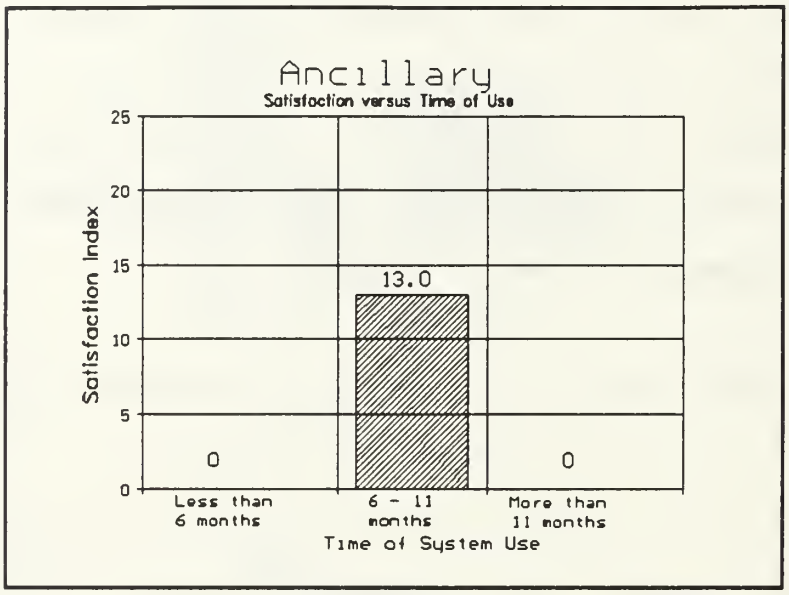


Figure 7.9

The administrative group's level of satisfaction tends to increase with experience and time of use. Respondents, with less than six months use, recorded a satisfaction index of 5.3. As the users gained experience (six to 11 months), the level of satisfaction increased to 10.8. For users with greater than 11 months experience, the satisfaction index elevated to 12.06. Figure 7.10 represents the administrative users' satisfaction index versus the time of system use.

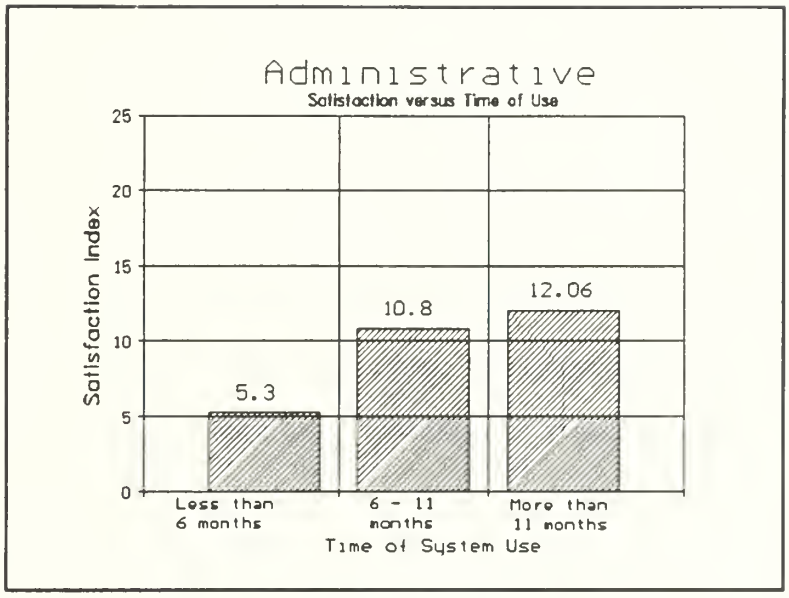

Administrative
Satisfaction versus Time of Use
Satisfaction Index
25
20
15
10
5
0
5.3
10.8
12.06
Less than 6 months
6 - 11 months
More than 11 months
Time of System Use

Figure 7.10

VIII. COMPARISON OF RESULTS FROM FORT ORD AND PENSACOLA

A. INTRODUCTION

When the user satisfaction survey questionnaire is assessed within a single organization, the UIS scores are indicative of the general level of user satisfaction with a specific information system. The scores, positive or negative, are on its own an important finding. However, the scores are useful for comparisons across different users of the same information system (to pinpoint the problems particular users may be experiencing), as well as for comparisons across various information systems (to highlight specific information systems that may be problematic). (Baroudi and Orlikowski, 1988). Silas B. Hays Army Hospital (Fort Ord) and Pensacola Naval Hospital are two different organizations with similar information systems (AQCESS). This chapter will compare the user information satisfaction (UIS) measurements recorded from Fort Ord with the UIS measurements recorded from Pensacola. In a later chapter, these findings will be analyzed to pinpoint any agreements or disagreements amongst the work groups of these organizations.

B. OVERALL USER SATISFACTION

The impressions of the respondents from Pensacola and Fort Ord towards their information system are comparable. Using a t-test, the satisfaction level of the two organizations, has no significant difference at alpha = 0.05. The Fort Ord respondents did register a slightly higher level of satisfaction at 10.47 which is inconsequential compared to Pensacola's overall satisfaction index at 9.02. Together their overall level of satisfaction is approximately 9.64. Figure 8.1 describes the extent of the difference in the satisfaction level of the two organizations.

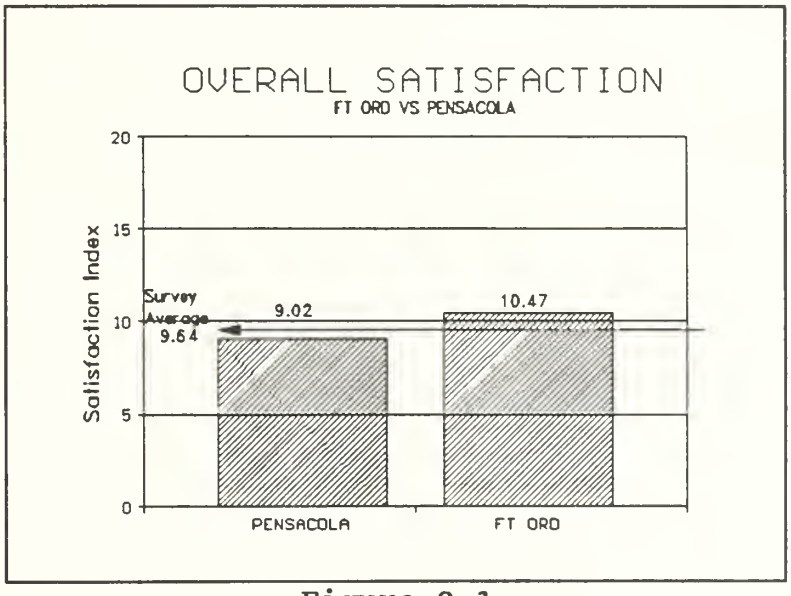


Figure 8.1

The combined work groups' overall satisfaction was determined by combining the mean of the sum of their corresponding satisfaction indices measured from the survey

questions of the 57 respondents from Fort Ord and the 174 respondents from Pensacola. The survey results, for the combined administrative group, display the highest overall satisfaction index at 11.87, followed by the combined ancillary group's level of satisfaction at 9.46. Fort Ord did not have any survey responses from physicians. Thus the overall satisfaction level, -4.16, for the physicians' is obtained solely from the Pensacola physicians. As noted in chapter six, the physician's level of satisfaction has a statistically significant lower difference than the other groups at alpha = 0.05. Figure 8.2 describes the overall level of satisfaction of the work groups from Fort Ord and Pensacola.

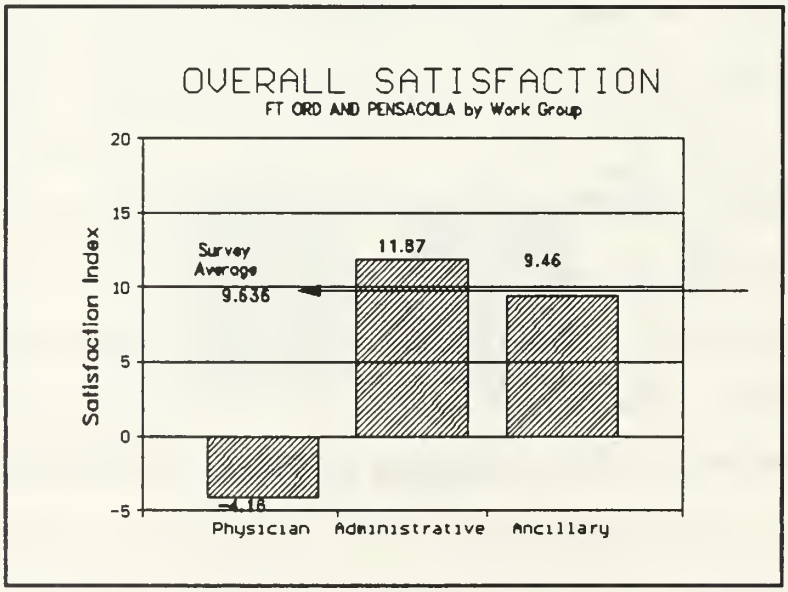


Figure 8.2

1. Fort Ord's and Pensacola's Individual Question Responses

The method used to calculate the values of the individual question responses was described in earlier chapters. Together, Fort Ord and Pensacola display a similar pattern of satisfaction levels for individual question responses as they did separately. Still, questions 1, 6 and 11 (deals with issues concerning MID/IMD) show the highest level of satisfaction. Consistent with previous reports, questions 2, 3 and 12 (deals with DMSSC services and management) has the lowest rated indices. Figure 8.3 illustrates the combined survey question responses for Fort Ord and Pensacola.

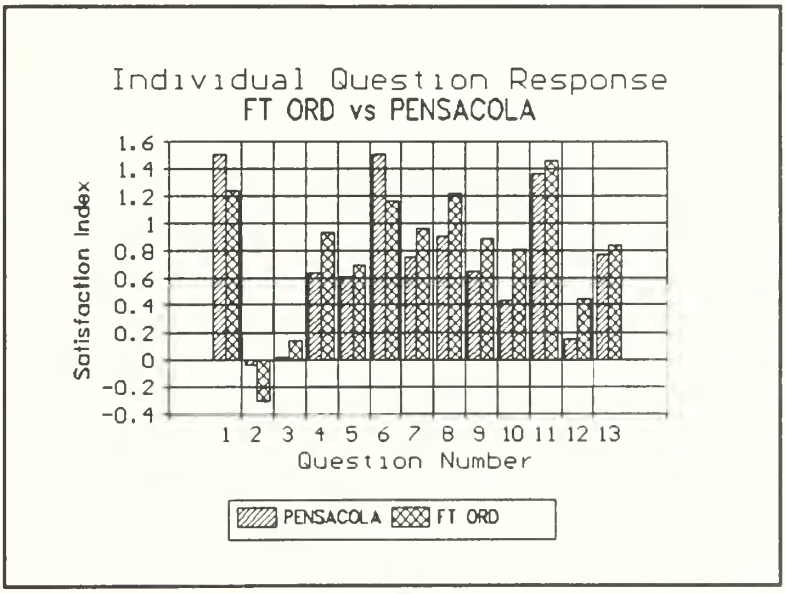


Figure 8.3

The combined work groups display a similar pattern of satisfaction levels for individual question responses as previously noted. Questions 1, 6 and 11 consistently rate as having the highest level of satisfaction, while questions 2, 3 and 12 consistently rate as having the lowest level of satisfaction by the respondents of the combined work groups. Each question will be discussed further in the following sections. Since the physician's responses are solely from Pensacola and are not changed by combining the work group responses from Fort Ord, they will not be discussed as part of the work group. They will be reflected in the overall comparison of the individual question responses between Fort Ord and Pensacola. Figure 8.4 illustrates the satisfaction index for individual questions by combined work groups.

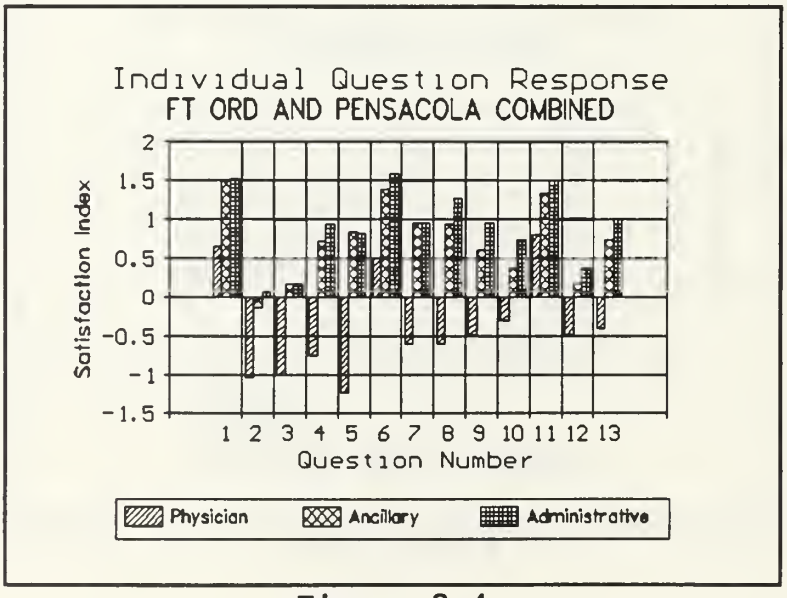


Figure 8.4

a. Question 1 - Relationship with the Information Management (MID/IMD) Staff

As noted earlier, the level of satisfaction towards the MID/IMD staff is relatively high. Pensacola's overall level of satisfaction was higher than Fort Ord's. Their combined administrative group and combined ancillary group responses to this question are practically the same. Overall, Pensacola shows a slightly higher level of satisfaction for their MID staff. There was no statistically significant difference at alpha = 0.05 for the combined work groups or hospitals.

b. Question 2 - Processing of Requests for Changes to Existing Systems

The responses to this question received the lowest satisfaction index rating. Both combined work groups and hospitals responses were negative towards the processing of requests for outside services. However, Fort Ord displayed a statistically significant lower difference lower at alpha = 0.05.

c. Question 3 - Degree of Training Provided to Users

The level of satisfaction for this item was rated next to the lowest by both the combined work groups and hospitals. There was no statistically significant difference at alpha = 0.05.

d. Question 4 - User's Understanding of the System

Fort Ord and the combined administrative group displayed the highest level of satisfaction toward comprehension of their system. There was no statistically significant difference between at alpha = 0.05.

e. Question 5 - User's Feeling of Participation

The work groups and hospitals show relatively the same level of satisfaction for involvement and participation in services and the functioning of the system. There was no statistically significant difference at alpha = 0.05.

f. Question 6 - Attitude of the Information Management (MID/IMD) Staff

Fort Ord the combined administrative group tend to show a slightly higher level of satisfaction toward their MID/IMD staffs. There was no statistically significant difference at alpha = 0.05.

g. Question 7 - Reliability of Output Information

Fort Ord perceives slightly higher degree of satisfaction for reliability of output information. The combined work groups' level of satisfaction seems were comparable. There was no statistically significant difference at alpha = 0.05.

h. Question 8 - Relevancy of Output Information (to intended function)

Fort Ord and the combined administrative group had a higher level of satisfaction regarding the relevancy of output information. There was no statistically significant difference at alpha = 0.05.

i. Question 9 - Accuracy of Output Information

Fort Ord and the combined administrative group tend to be more confident in the accuracy of the output information. There was no statistically significant difference at alpha = 0.05.

j. Question 10 - Precision of Output Information

The precision of the output information is more favorable to Fort Ord and the combined administrative group. There was no statistically significant difference at alpha = 0.05.

k. Question 11 - Communication with the Information Management Division (MID/IMD) Staff

The manner and methods of information exchange between the users and MID/IMD staff are highly valued by the hospitals and the combined work groups. There was no statistically significant difference by t-test at alpha = 0.05.

l. Question 12 - Time Required for New Systems Development

According to the hospitals' and combined work groups' level of satisfaction, the elapsed time for new systems development by DMSSC or contractors is practically unacceptable. Fort Ord may be slightly more tolerant than Pensacola for development of new systems. There was no statistically significant differences at alpha = 0.05.

m. Question 13 - Completeness of Output

Almost an even level of satisfaction amongst the hospitals and the combined work groups. They show some satisfaction towards the comprehensiveness of the output information. There was no statistically significant difference at alpha = 0.05.

2. Combined Grouped Factors

Fort Ord's and Pensacola's overall responses for the grouped factors are joined together to form overall combined grouped factors. These overall combined grouped factors are broken down to form overall work group factors. Refer to chapters six and seven for further discussion on group factors. The following sections will discuss the overall combined factors and combined work group factors for Fort Ord and Pensacola. The physicians will not be included in the discussion compared by work group. Neither the hospitals' or work groups' satisfaction level for any of the factors were

statistically different at significance level alpha = 0.05. Figure 8.5 represents the overall grouped factors for Fort Ord and Pensacola.

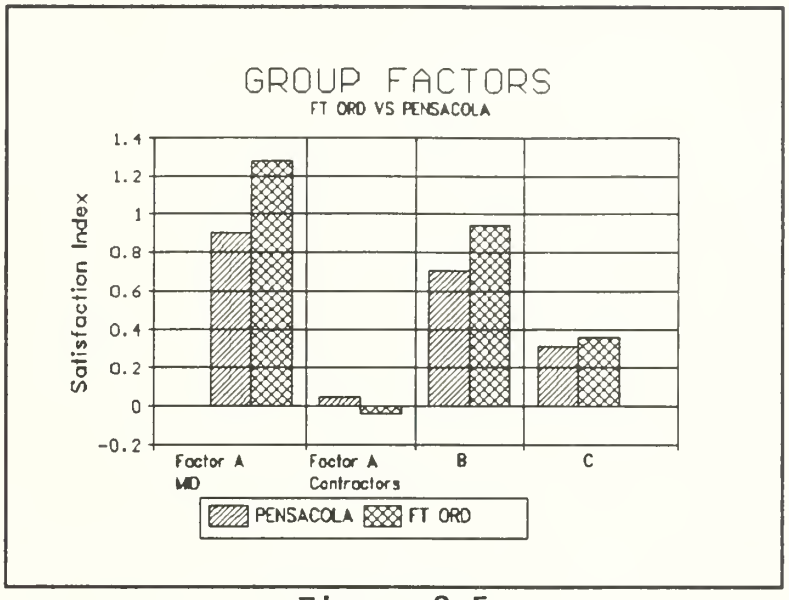


Figure 8.5

Figure 8.6 represents the overall factors by work groups.

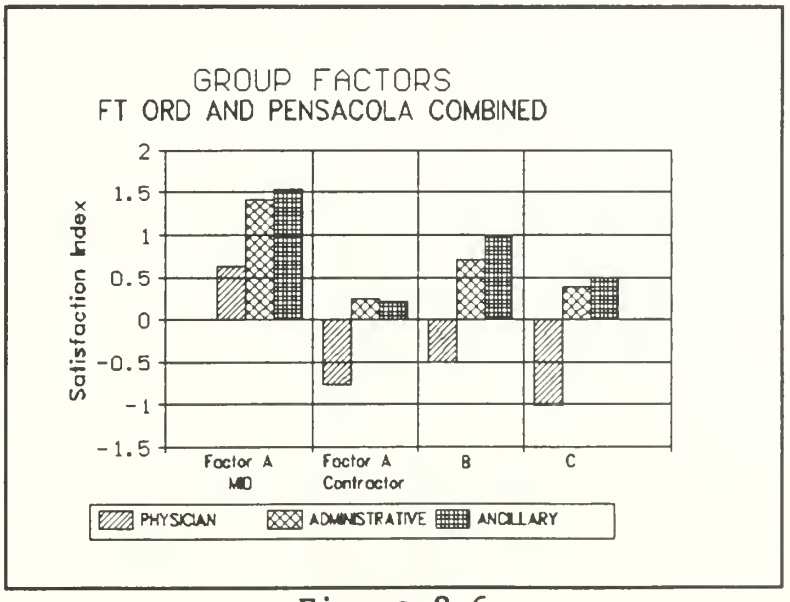


Figure 8.6

a. Factor A (Local MID/IMD Staff and Services)

Fort Ord and the combined ancillary group has the highest level of satisfaction for the MID/IMD staff and services. This factor was rated the highest overall. There was no statistically significance difference at alpha = 0.05.

b. Factor A (Contractor Services)

Consistent with other results, this factor received the lowest level of satisfaction of any factor. There was no statistically significant difference at alpha = 0.05.

c. Factor B - Information Product

This factor is the second highest rated of the four factors. There was no statistically significant difference at alpha = 0.05.

d. Factor C - Knowledge and Involvement

This factor showed no statistically significant difference between the level of satisfaction among the work groups. The administrative work group and Fort Ord rated knowledge and involvement slightly better than the other groups.

IX. COMPARISON OF RESULTS FROM SILAS B. HAYS HOSPITAL, NAVAL HOSPITAL, PENSACOLA (AQCESS) AND NAVAL HOSPITAL, CHARLESTON (CHCS)

A. INTRODUCTION

This chapter compares AQCESS and the CHCS user satisfaction findings. Both systems are fully described in chapters II and III. The survey results for user satisfaction are compared with respect to each site, system versus system and each work group. The criteria are as follows: 1) overall satisfaction, 2) responses to individual questions, 3) three group factors: MID staff and services; information system product; knowledge or involvement. (Baroudi and Orlikowski, 1988)

1. Overall Satisfaction (Pensacola, Fort Ord, Charleston)

The mean overall satisfaction index of the combined sites is 11.07 on a scale ranging from -39 to +39. Charleston (CHCS site) displays the highest overall satisfaction at 11.25, followed by Fort Ord at 10.47. Pensacola registers the least overall satisfaction at 9.025. Using a t-test, the level of satisfaction was not statistically significant at alpha = 0.05. Figure 9.1 illustrates the overall satisfaction index for each site.

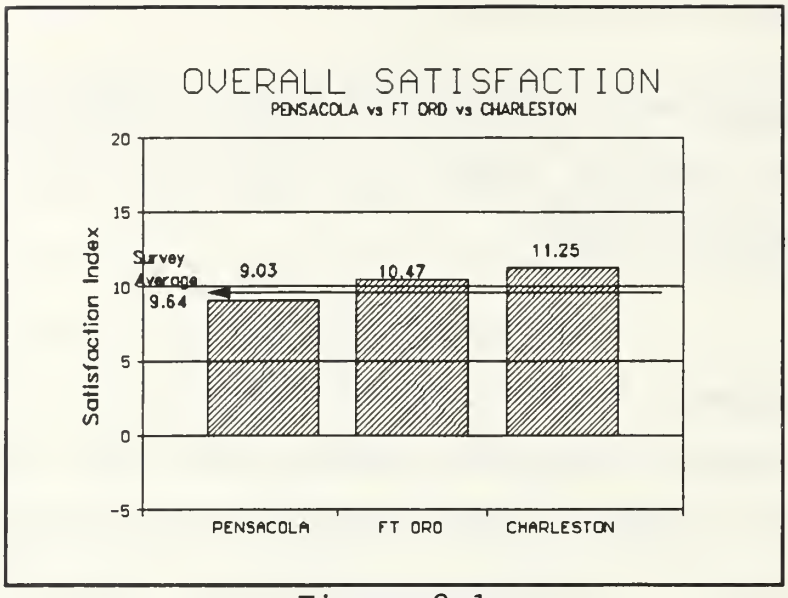


Figure 9.1

2. Individual Questions

Figure 9.2 displays the average level of satisfaction for each site. Responses to questions 1, 6 and 11 indicate a high level of user satisfaction. As stated earlier, these

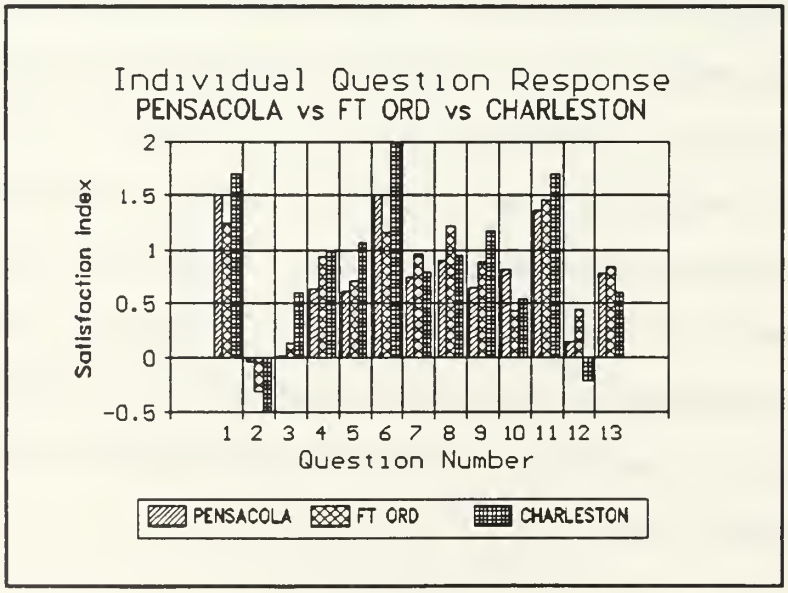


Figure 9.2

questions are concerned with the Management Information (MID/IMD) staff. Consistent with previous findings, responses to questions 2, 3 and 12 stand out as exhibiting a relatively low satisfaction index. Questions 2 and 12 are concerned with outside contractors and/or DMSSC services and question 3, training. The following discussion will further elaborate on each question.

a. Question 1 - Relationship with the Management Information (MID/IMD) Staff

The level of satisfaction towards the MID staff is relatively high (second highest satisfaction index). Charleston shows the highest level of satisfaction of the three sites, closely followed by Pensacola. Fort Ord reports the lowest satisfaction index. There is no statistically significant difference at alpha = 0.05.

b. Question 2 - Processing of Requests for Changes to Existing Systems

All three sites reports a negative level of satisfaction for time to process requests for changes to existing system. This, the lowest scoring response, is consistent with previous descriptions. Pensacola gave it the lowest rating, followed by Charleston and Fort Ord, respectively. The level of satisfaction for Pensacola was statistically significant difference lower versus Charleston's level of satisfaction at alpha = 0.05.

c. Question 3 - Degree of Training Provided to Users

The level of satisfaction of each site was positive but nearly neutral at Pensacola and Fort Ord. Charleston reported the highest satisfaction index. However, Pensacola showed a statistically significant lower difference to Charleston's level of satisfaction at alpha = 0.05.

d. Question 4 - User's Understanding of the System

Fort Ord and Charleston were nearly equal in satisfaction, while Pensacola reported a lower satisfaction index. There is no statistically significant difference at alpha = 0.05.

e. Question 5 - User's Feeling of Participation

Charleston rated this item a little higher than Fort Ord or Pensacola, which reported a similar level of satisfaction. However, Pensacola showed a statistically significant lower difference than Charleston's level of satisfaction at alpha = 0.05.

f. Question 6 - Attitude of the Management Information (MID/IMD) Staff

This was the highest rated satisfaction index of all 13 indices. Charleston's response rated very high while Pensacola followed closely. Fort Ord's response was rated lower, but positive. Pensacola's and Fort Ord's level of satisfaction show a statistically significant lower difference to Charleston's level of satisfaction at alpha = 0.05.

g. Question 7 - Reliability of Output Information

Fort Ord rated this item higher than either Pensacola or Charleston, which responded similarly. There is no statistically significant difference at alpha = 0.05.

h. Question 8 - Relevancy of Output Information (to intended function)

Again, Fort Ord rated this item higher than either Pensacola or Charleston, which responded similarly. There is no statistically significant difference at alpha = 0.05.

i. Question 9 - Accuracy of Output Information

The response to this question resulted in a relatively high satisfaction index for Charleston which is followed by Fort Ord. Pensacola's level of satisfaction shows a statistically significant lower difference to Charleston's level of satisfaction at alpha = 0.05.

j. Question 10 - Precision of Output Information

Pensacola and Charleston reported similar levels of satisfaction. Fort Ord, although not to any large degree, reported a higher level of satisfaction. There is no statistically significant difference at alpha = 0.05.

k. Question 11 - Communication with the Management Information (MID/IMD) Staff

This item is rated among the top three in levels of satisfaction. Charleston has the highest index, Fort Ord is second and Pensacola, although positive, reports the lowest

level of satisfaction. There is no statistically significant difference at alpha = 0.05.

l. Question 12 - Time Required for New Systems Development

This item is rated as the second lowest among the 13 responses. Charleston's response results in a negative index which has statistically significant lower difference at alpha = 0.05. Fort Ord has the highest level of satisfaction.

m. Question 13 - Completeness of Output

The responses to this question are relatively close. Charleston demonstrates the lowest level of satisfaction while Fort Ord has the highest. There is no statistically significant difference at alpha = 0.05.

3. Grouped Factors

The following sections will discuss the overall combined factors by sites. Fort Ord's and Pensacola's levels of satisfaction displays a statistically significant lower difference to Charleston's level of satisfaction at alpha = 0.05. Figure 9.3 represents each site's level of satisfaction with respect to the grouped factors.

a. Factor A (Local MID/IMD Staff and Services)

As seen in Figure 9.3, Charleston displays the highest level of satisfaction, followed by Fort Ord. The lowest level of satisfaction is reported by Pensacola. Both

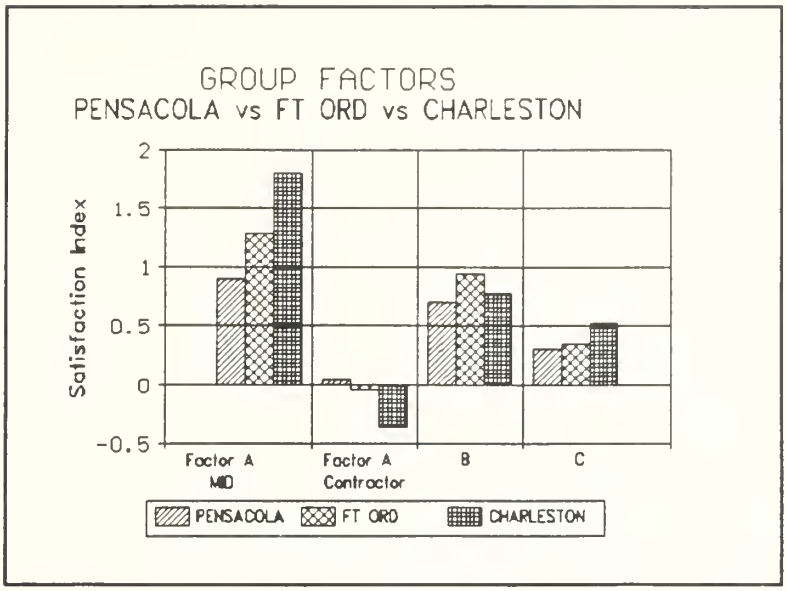


Figure 9.3

Fort Ord's and Pensacola's levels of satisfaction results in a statistically significant lower difference to Charleston's at alpha = 0.05.

b. Factor A (Contractor, DMSSC)

This factor received the lowest level of satisfaction of any group factor. All sites rated this factor extremely low, with Pensacola and Fort Ord almost rating it nearly neutral. There is no statistically significant difference at alpha = 0.05.

c. Factor B - Information System Product

This was the second highest rated factor. All three sites report similarly, with Fort Ord recording the highest level of satisfaction. There is no statistically significant difference at alpha = 0.05.

d. Factor C - Knowledge and Involvement

The second lowest rated factor, all sites report similarly. Charleston's level of satisfaction is the highest, followed by Ford Ord's. Pensacola's level of satisfaction is the lowest. There is no statistically significant difference at alpha = 0.05.

4. Overall Satisfaction (CHCS vs AQCESS)

The average overall satisfaction index of CHCS and AQCESS is 10.54. CHCS reports the highest overall satisfaction (11.25), with AQCESS at 10.13. Using a t-test, the difference in level of satisfaction is not statistically significant at alpha = 0.05. Figure 9.4 illustrates the overall satisfaction index for each system.

5. Individual Questions

Figure 9.5 displays the average level of satisfaction for each site. Again, responses to questions 1, 6 and 11 indicate a high level of user satisfaction. (MID/IMD) Also consistent with previous findings, responses to questions 2, 3 and 12 stand out as exhibiting a relatively low satisfaction index. Questions 2 and 12 are concerned with outside contractors and/or DMSSC services and question 3, training. The following discussion will further examine each question.

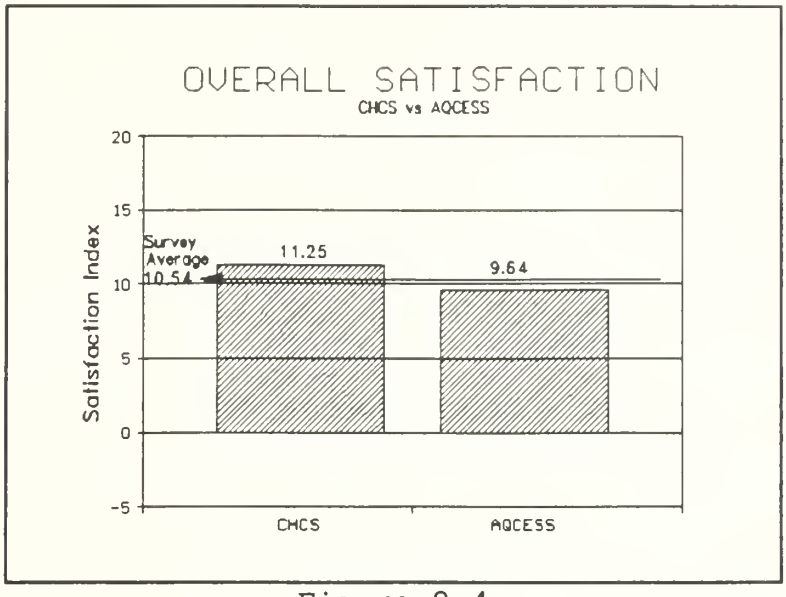


Figure 9.4

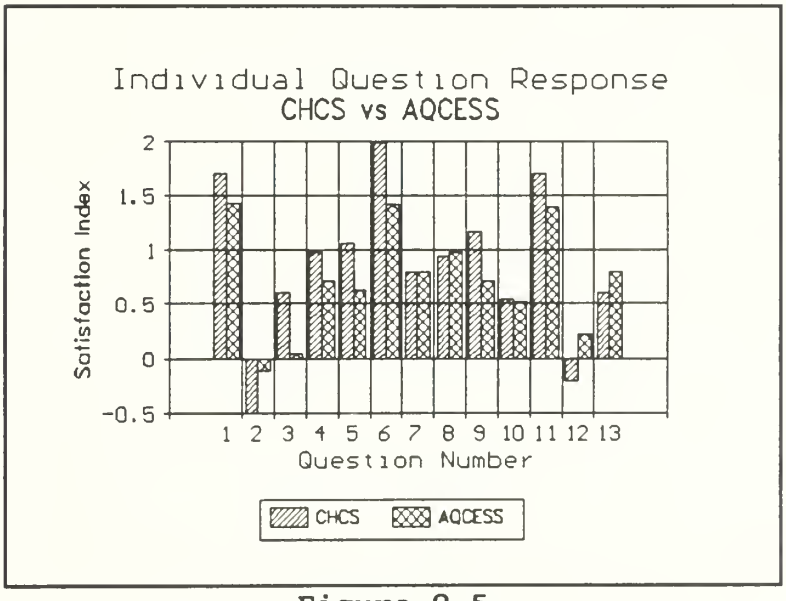


Figure 9.5

a. Question 1 - Relationship with the Management Information (MID/IMD) Staff

The level of satisfaction towards the MID staff is relatively high (second highest satisfaction index). CHCS users have the higher level of satisfaction, however, there is no statistically significant difference at alpha = 0.05 between the two indices.

b. Question 2 - Processing of Requests for Changes to Existing Systems

This, the lowest scoring response, received a negative index from both system users. CHCS users reported the lowest satisfaction rating, however, there was no statistically significant difference at alpha = 0.05.

c. Question 3 - Degree of Training Provided to Users

The level of satisfaction for each system was positive but nearly neutral for AQCESS users. CHCS showed a statistically significant lower difference at alpha = 0.05.

d. Question 4 - User's Understanding of the System

CHCS was rated higher in satisfaction than AQCESS for this item. There was, however, no statistically significant difference between the indices at alpha = 0.05.

e. Question 5 - User's Feeling of Participation

CHCS users reported a higher index than AQCESS users. AQCESS showed a statistically significant lower difference at alpha = 0.05.

f. Question 6 - Attitude of the Management Information (MID/IMD) Staff

Again, this was the highest rated satisfaction index of all 13 indices. CHCS users' response was rated very high while AQCESS users, who yielded a positive rating, were statistically significant difference lower at alpha = 0.05.

g. Question 7 - Reliability of Output Information

The satisfaction indices for this item were positive and virtually the same.

h. Question 8 - Relevancy of Output Information (to intended function)

Both CHCS and AQCESS users gave positive responses. There was no statistically significant difference at alpha = 0.05.

i. Question 9 - Accuracy of Output Information

The response to this question resulted in a relatively high satisfaction index for CHCS users. However, AQCESS users show a statistically significant difference lower at alpha = 0.05.

j. Question 10 - Precision of Output Information

The CHCS and AQCESS users responded similarly with no statistically significant difference at alpha = 0.05.

k. Question 11 - Communication with the Management Information (MID/IMD) Staff

Rated third highest index overall, there was no statistically significant difference at alpha = 0.05.

l. Question 12 - Time Required for New Systems Development

This item is rated as the second lowest among the 13 indices. CHCS users' response resulted in a negative index, while AQCESS users showed a statistically significant higher difference at alpha = 0.05.

m. Question 13 - Completeness of Output

The responses to this question were positive with no statistically significant difference at alpha = 0.05.

6. Grouped Factors

The following sections will discuss the overall combined factors for the respondents of the CHCS and AQCESS systems. Figure 9.6 represents each site's level of satisfaction in relation to group factors.

a. Factor A (Local MID/IMD Staff and Services)

As seen in Figure 9.6, CHCS respondents report a much higher level of satisfaction for their local staff and services. AQCESS respondents' level of satisfaction show a statistically significant lower difference at alpha = 0.05.

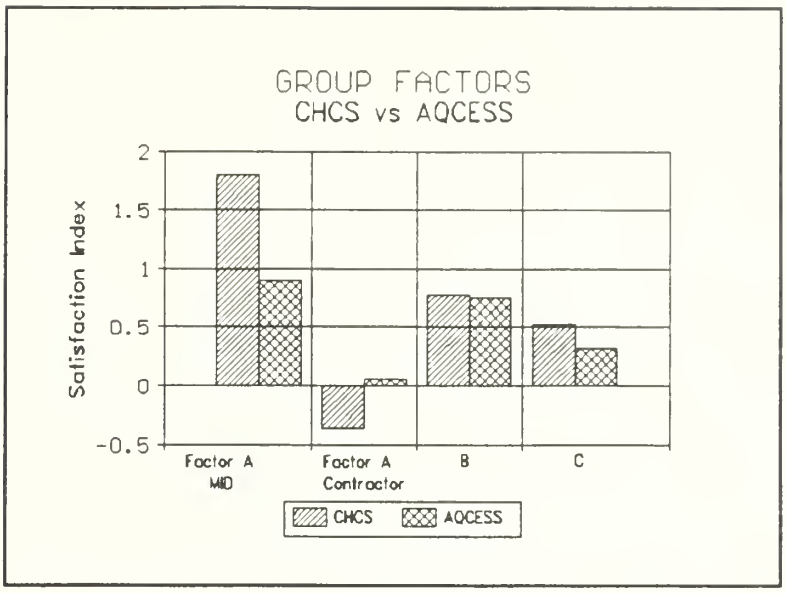


Figure 9.6

b. Factor A (Contractor, DMSSC)

This factor received the lowest level of satisfaction of any group factor. Both systems' users rate this factor low, with CHCS being statistically significant difference lower at alpha = 0.05.

c. Factor B - Information System Product

CHCS and AQCESS users responded essentially the same. There is no statistically significant difference in levels of satisfaction from either systems' respondents at alpha = 0.05.

d. Factor C - Knowledge and Involvement

The users of the CHCS system display a slightly higher level of satisfaction than the AQCESS users. There is no statistically significant difference at alpha = 0.05.

X. COMBINED DESCRIPTIVE FINDINGS OF CHCS AND AQCESS

A. INTRODUCTION

The AQCESS and CHCS systems, although similar in many areas, are functionally different systems. However, the survey responses from both systems are joined to assist in the analysis of findings across these systems. Chapter IX compared the Charleston Naval Hospital's CHCS system to Pensacola Naval Hospital's and Fort Ord Army Hospital's AQCESS systems. This chapter will examine the combined results of the survey responses from the hospitals. Figure 10.1 shows a breakdown of the respondents by work groups from the combined hospitals.

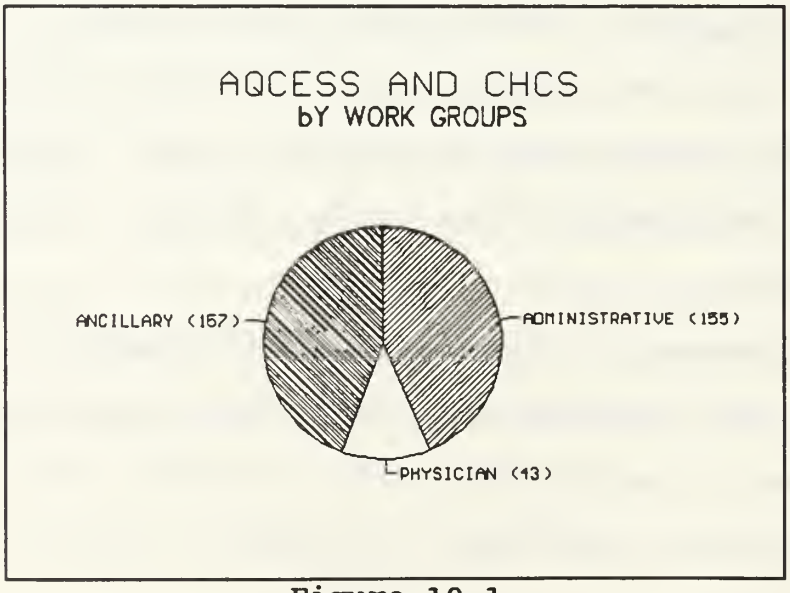


Figure 10.1

B. OVERALL USER SATISFACTION FOR THE COMBINED INFORMATION SYSTEMS

The overall satisfaction is measured by the mean of the sum of the responses to the survey questions from the hospitals. A t-test the overall satisfaction level of the ancillary group and administrative group has no statistically significant difference at alpha = 0.05. The physicians are statistically significant difference lower response at alpha = 0.05. The survey shows that the ancillary group displays the highest overall satisfaction index at 11.47. When compared to the overall satisfaction index of the administrative groups level at 11.43, the ancillary group and administrative group overall satisfaction for their information systems are approximately equal. The physicians level of satisfaction index for the systems are the lowest at 1.35. The overall satisfaction level was 10.14. Figure 10.2 illustrates the combined work groups level of satisfaction for the AQCESS and CHCS hospital information systems.

1. Individual Question Responses for AQCESS and CHCS

The method used to calculate the values of the individual question responses is described in earlier chapters. Together, the CHCS and AQCESS systems show the same trend as the other comparisons. Questions 1, 6 and 11 (deals with issues concerning MID/IMD) show the highest level of satisfaction. Consistent, questions 2, 3 and 12 (deals with

DMSSC services and management) have the lowest rated indices. Figure 10.3 displays the overall level of satisfaction for individual questions for the CHCS and AQCESS combined work groups.

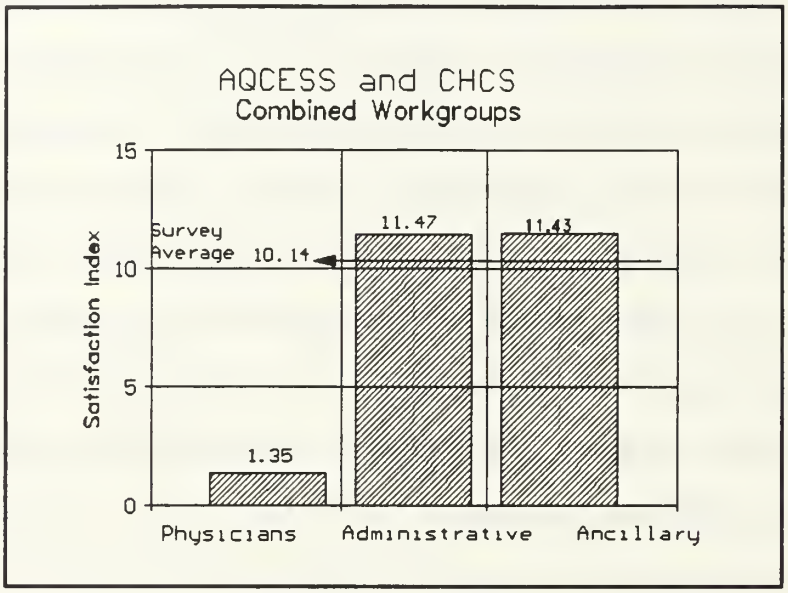


Figure 10.2

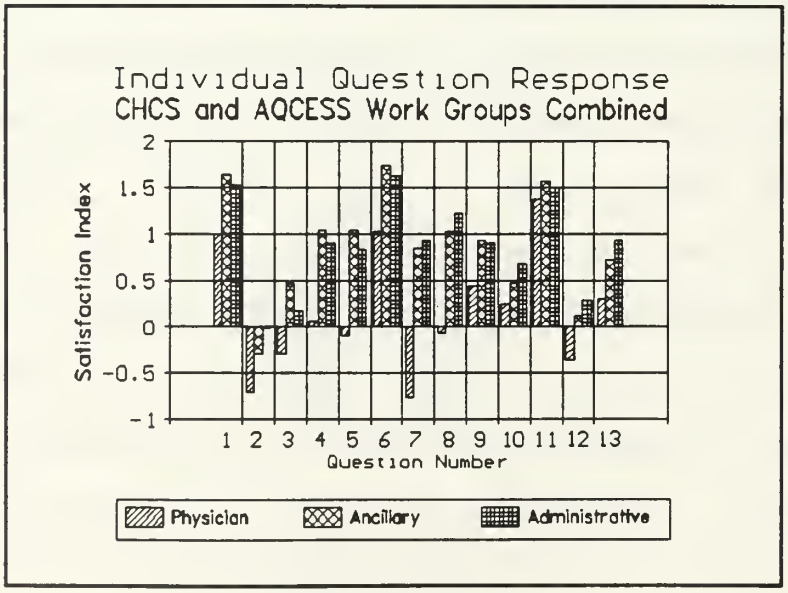


Figure 10.3

In the comparisons of one work group versus the remaining work groups, the patterns of satisfaction levels for individual question responses are similar. Questions 1, 6 and 11 consistently rate the highest level of satisfaction, while questions 2, 3 and 12 consistently rate the lowest level of satisfaction by the respondents of the combined work groups. Each question will be discussed further in the following sections. Figure 10.4 displays the responses to individual by physicians compared to the remainder of respondents; Figure 10.5 ancillary compared to the other groups; Figure 10.6 administrative compared to the other groups.

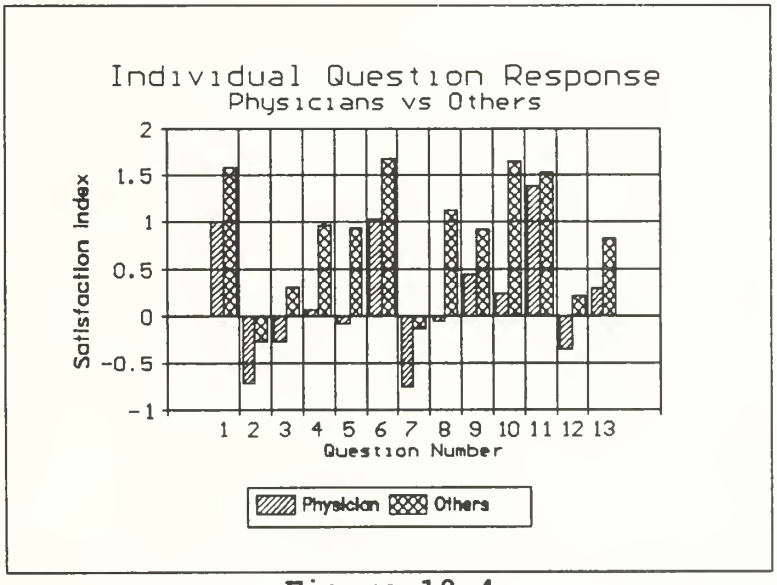


Figure 10.4

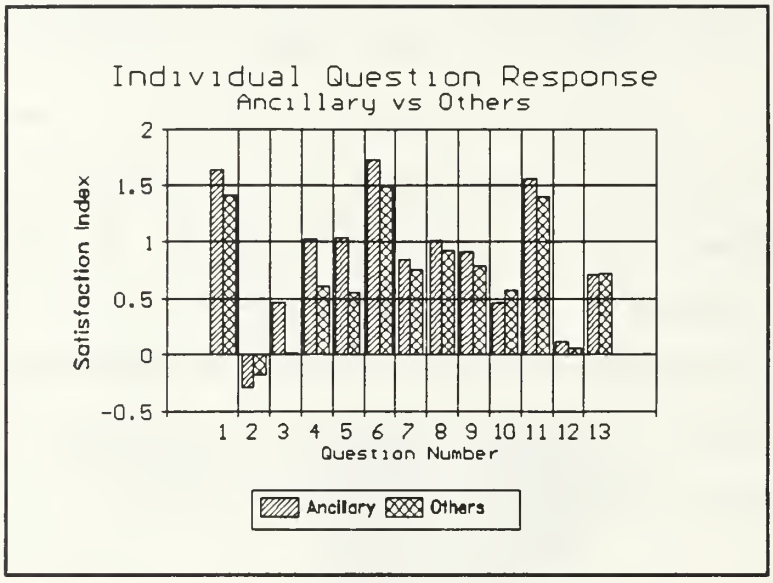


Figure 10.5

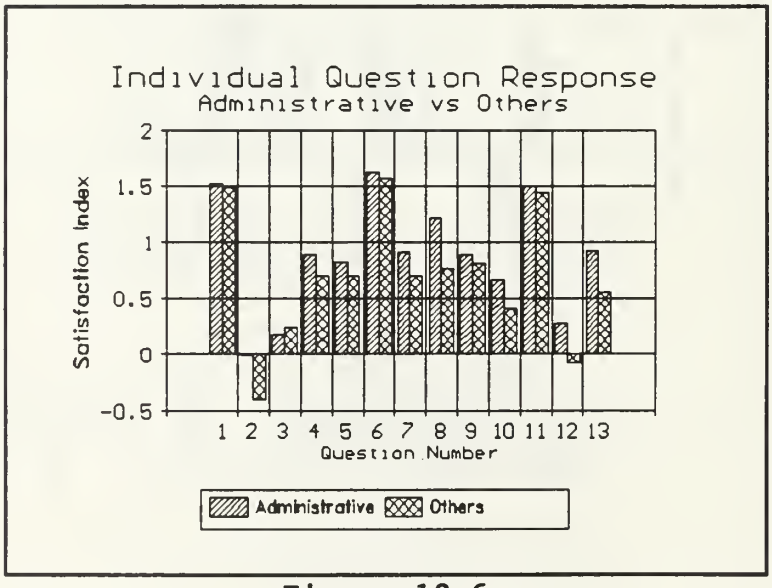


Figure 10.6

a. Question 1 - Relationship with the Information Management (MID/IMD) Staff

As noted earlier, the level of satisfaction towards the MID/IMD staff is relatively high. The level of satisfaction is higher for the ancillary group than the others but not much higher than the administrative group. The physicians show a statistically significant lower difference at alpha = 0.05.

b. Question 2 - Processing of Requests for Changes to Existing Systems

The responses to this question received the lowest satisfaction index rating. All work groups' responses were negative towards the processing of requests for outside services to make changes to the existing systems. However, the level of satisfaction of the administrative work group showed a statistically significant higher difference at alpha = 0.05. The ancillary group was much lower followed by the physicians.

c. Question 3 - Degree of Training Provided to Users

The ancillary group shows a higher level of satisfaction for the amount of training they have received on using. The physicians expressed the lowest level of satisfaction for the degree of training they have received. The level of satisfaction for the ancillary group shows a statistically significant higher difference and the physicians'

level of satisfaction has a statistically significant lower difference lower at alpha = 0.05.

d. Question 4 - User's Understanding of the System

The ancillary group displayed the highest level of satisfaction toward comprehension of their systems. The level of satisfaction for the ancillary group has a statistically significant higher difference at alpha = 0.05. The level of satisfaction for the physicians showed a statistically significant lower difference at alpha = 0.05.

e. Question 5 - User's Feeling of Participation

The ancillary group showed the highest level of satisfaction for involvement and participation in services and the functioning of the system followed closely by the administrative group. The ancillary group's level of satisfaction showed a statistically significant higher difference while the physicians' level of satisfaction showed a statistically significant lower difference at alpha = 0.05.

f. Question 6 - Attitude of the Information Management (MID/IMD) Staff

Even though the physicians showed level of satisfaction that was a statistically significant lower difference at alpha = 0.05, all work groups responded favorably to the attitudes of the MID/IMD staffs. The ancillary groups' level of satisfaction was the highest, followed closely by the administrative group.

g. Question 7 - Reliability of Output Information

The perceptions of the work groups for reliability of output information were relatively low. The administrative group's level of satisfaction was slightly higher than the ancillary work group's. The physicians' level of satisfaction was extremely low and showed a statistically significant lower difference at alpha = 0.05.

h. Question 8 - Relevancy of Output Information (to intended function)

Regarding the relevancy of output information, the administrative group had a higher level of satisfaction, followed closely by the ancillary group. The physicians' level of satisfaction showed a statistically significant lower difference at alpha = 0.05.

i. Question 9 - Accuracy of Output Information

All work groups showed positive degree of confidence in the accuracy of the output information. The level of satisfaction for the ancillary group is slightly higher but nearly even with the satisfaction level of the administrative group. The physicians level of satisfaction is the lowest. There was no statistically significant difference in the level of satisfaction for the groups.

j. Question 10 - Precision of Output Information

All work groups' level of satisfaction for the precision of the output information was relatively low. The

administrative group's level of satisfaction was the highest, followed closely by the ancillary group. The physicians' level of satisfaction is the lowest. There was no statistically significant difference in level of satisfaction at alpha = 0.05.

k. Question 11 - Communication with the Information Management Division (MIS/IMD)

The manner and methods of information exchange between the users and the MID/IMD staffs was highly valued by the work groups. The ancillary group's level of satisfaction was the highest. Slightly closer were the administrative group and physicians. This was the highest level of satisfaction recorded by the physicians. There was no statistically significant difference at alpha = 0.05.

l. Question 12 - Time Required for New Systems

The work groups' level of satisfaction, for time required to develop new systems by DMSSC or contractors, was very low. The administrative group's level of satisfaction for the systems was the highest, followed by the ancillary group. The physicians' level of satisfaction was extremely low. The administrative group's level of satisfaction revealed a statistically significant higher difference and the physicians' level of satisfaction revealed a statistically significant lower difference at alpha = 0.05.

m. Question 13 - Completeness of Output

The work groups showed some satisfaction towards the comprehensiveness of the output information. The administrative group's level of satisfaction was the highest, followed by the ancillary group. The physicians recorded the lowest level of satisfaction. The administrative group's level of satisfaction showed a statistically significant higher difference at alpha = 0.05.

2. Combined Grouped Factors

The following sections will discuss the overall combined factors by work groups. The physicians' level of satisfaction displayed a statistically significant lower different for the four factors at alpha = 0.05. Figure 10.7 represents the work groups' level of satisfaction with respect to the sub-total factors. Figure 10.8 displays the satisfaction level for the factors by the physicians compared to the remainder of the groups; Figure 10.9 ancillary compared to the others; Figure 10.10 administrative compared to the others.

a. Factor A (Local MID/IMD Staff and Services)

The ancillary group had the highest level of satisfaction for the MID/IMD staff, followed closely by the administrative group. Although this factor was rated as being the highest level of satisfaction by the work groups, the

physicians' level of satisfaction showed a statistically significant lower difference at alpha = 0.05.

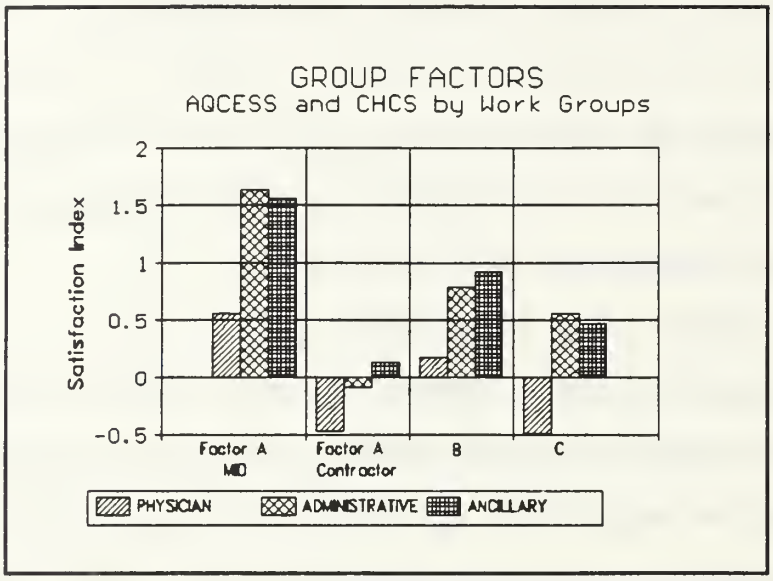
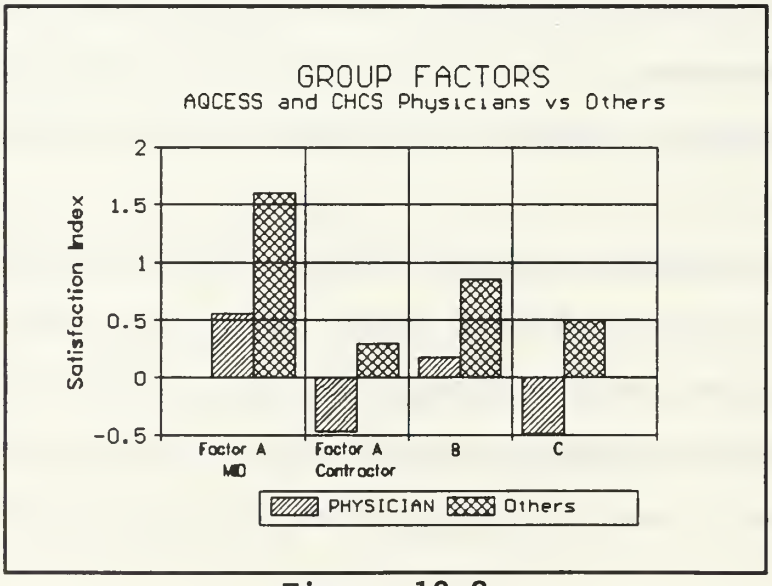


Figure 10.7



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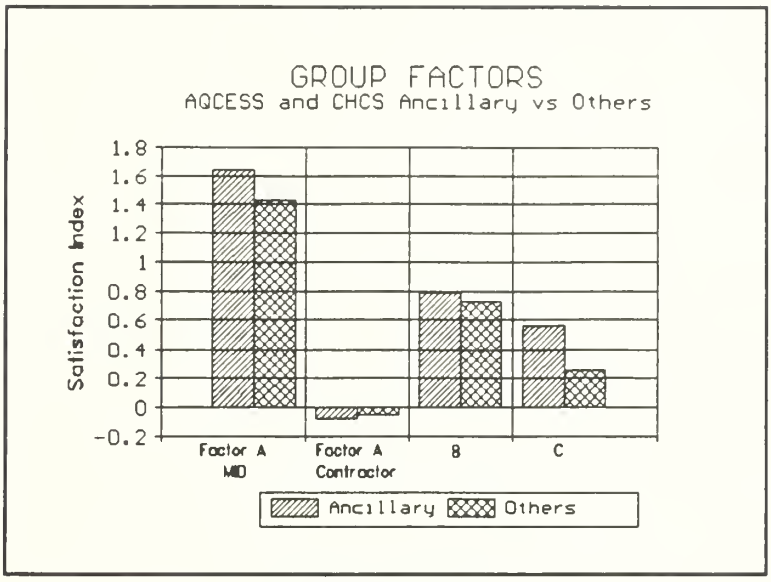

Figure 10.9

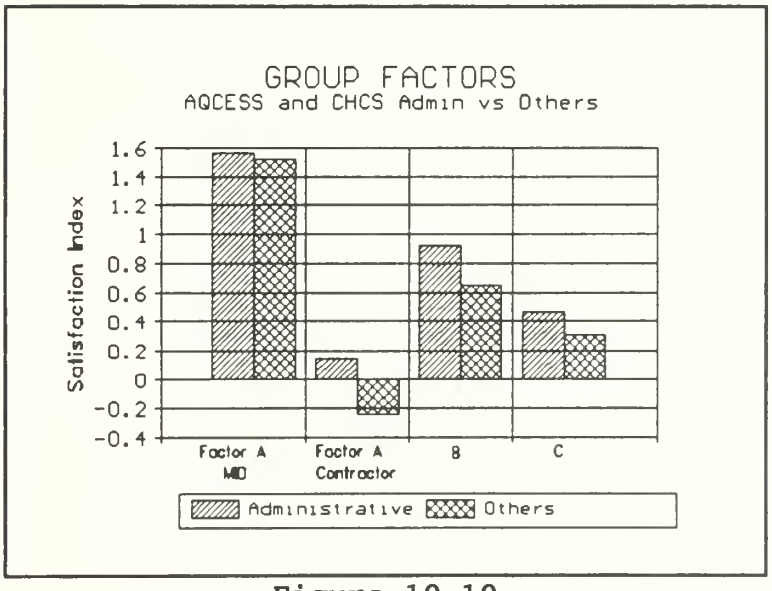

Figure 10.10

b. Factor A (Contractor Services)

The type and quality of services rendered by DMSSC or contractors have been consistently rated low by the work groups in all comparisons. The ancillary group showed the only positive level of satisfaction amongst the groups, but was nearly neutral. The administrative group followed with a negative rating for level of satisfaction and the physician with the lowest. The physicians' level of satisfaction showed a statistically significant lower difference at alpha = 0.05.

c. Factor B - Information Product

This factor was rated positive by all groups. The highest level of satisfaction was given by the ancillary group which was comparable to the administrative group's. The physicians' level of satisfaction for the information product was the lowest and showed a statistically significant lower difference at alpha = 0.05.

d. Factor C - Knowledge and Involvement

The administrative group's level of satisfaction for knowledge and involvement was the highest, closely followed by the ancillary group. The physicians showed a statistically significant lower difference, at alpha = 0.05.

XI. ANALYSIS OF FINDINGS

A. INTRODUCTION

Performance evaluation is a crucial part of the management of an information system. The amounts of resources invested and the organization's dependence on information processing warrant the most efficient, effective use of the information system. However, without direction or objective, this evaluation is simply an assessment of the current operation of the information system. (Mensching and Adams, 1991) The purpose of this research is to measure and document the user information satisfaction of the Automated Quality of Care Evaluation Support System (AQCESS) at the Naval Hospital, Pensacola, Florida and Silas B. Hays Hospital, Fort Ord, California. These findings from the AQCESS system will be compared to those from the Composite Health Care System (CHCS) at the Naval Hospital, Charleston, South Carolina (Hurd, 1991). The results should not be viewed as being a conclusive evaluation of the AQCESS or CHCS systems, but provide a benchmark for analyzing user satisfaction and identifying possible areas of discontent. To obtain a deeper understanding of the identified and highlighted symptoms of discontent, interviews should be conducted to examine the

development and operating procedures of the particular work group involved in order to determine the underlying causes by adding context and history. Upon completion of this process, it may become possible to make refinements and tuning to the system to increase its effectiveness and, perhaps secondarily, its efficiency.

The first section will analyze the survey findings in chapters VI. through X. It will primarily focus on the differences and similarities among: work groups (administrative, ancillary, and physicians) at Pensacola; work groups at Fort Ord; combined work groups of Pensacola and Fort Ord; CHCS and AQCESS systems at Charleston, Pensacola and Fort Ord; combined work groups of Pensacola, Fort Ord and Charleston.

B. PENSACOLA OVERALL SATISFACTION

No one can deny that the AQCESS systems have not been a benefit to those sites that have this system. Automation has improved their overall efficiency and effectiveness. (NMDSC, 1991). Pensacola Naval Hospital has benefitted tremendously from the AQCESS system. In order for the AQCESS system to continue to be a successful computer system, it must provide the needed information required by the users (Olson and Baroudi, 1983). The following discussion will attempt to analyze the levels of dissatisfaction that are statistically significant by the respondents from Pensacola. Although not

conclusive, it should be used as a baseline measure to help verify areas in the AQCESS system that may require improvements or fine tuning.

1. Combined Groups

The overall satisfaction index is a general description of the user satisfaction with the system. The survey average satisfaction index is 9.64. The respondents average overall satisfaction is characterized as only being marginally satisfied.

2. Comparison of Work Groups

The physicians' level of satisfaction showed a statistically significant lower difference than the administrative and ancillary work groups. However, the administrative group was somewhat more satisfied than the ancillary group, but only slightly.

The physicians' group was dissatisfied with the system, which is indicated by their low average satisfaction index at -4.16. Generally, the only way the physicians legitimately interface with the system is by reviewing statistics of their performance, which are compiled by the Quality Assurance personnel. To a lesser degree, the physicians interact with the system through the Ad Hoc Report Generator module in the system. The physicians mainly view the system as a means of reporting their performance of patient care, which, according to their perspective, may not

be accurate. Therefore, any inaccuracies in a physician's performance report is viewed negatively by that physician and potentially leads to conflict with those who generate the reports. So, it is reasonable to assume that their overall low level of satisfaction can be attributed to their limited interface with the AQCESS system.

Ancillary made up 39 percent of the personnel surveyed. Their average satisfaction index is 11.49, slightly lower than the administrative group. Most of the users in this work group are technicians who use the system for direct medical care (e.g., canceling and editing disposition data, patient history, diagnosis and procedure data record tracking and reporting). As the large number of items processed each day in these areas increase, the response time for processing decreases to unacceptable levels. It has become routine for ancillary personnel to wait more than five minutes to retrieve records. When time is critical for patient care, this waiting is a source of frustration for ancillary personnel.

The administrative group recorded the highest overall satisfaction score. Administrative personnel use the system for purposes other than direct conduct of patient care. With a few exceptions, the work performed on the system can be accomplished without the pressure of a limited and specific time constraints. Therefore, they can use the computer system at a comparatively slower pace than the other work groups. Consequently, interviews with most administrative personnel

revealed concern about the slow computer response time. Additionally, interviews revealed a lack of trust for the integrity of the output information by the system. Some administrative personnel argued that their inability to correct data, once it had been entered into the system, made the information suspect.

3. Significant Individual Question Differences and

This section will discuss only those responses to the questions with significant differences among the work groups. The physicians' level of satisfaction for all questions showed statistically significant lower differences than those of the other work groups. A low level of satisfaction for all questions by the physicians can be expected due to their lack of involvement and understanding of the system coupled with their limited role as a user of the system. Those questions that are statistically significant for the ancillary and administrative personnel will be discussed in the following sections. Since the physicians' responses to the questions are statistically significant in every case, only those questions, which will be helpful in gaining a better appreciation of the degree satisfaction, will be analyzed.

a. Relationship with the Management Information Department (MID)

The results of the survey showed the physicians to be the least satisfied with the services of by the MID staff. Ironically, their level of satisfaction for this question was the highest of all their responses. Typically, unless it is to report inaccuracies in their performance report, which is generated by the system, the physicians' seldom communicate with the MID staff. If this was the only method in which the physicians and the MID staff communicated, then the physicians' relatively low level of satisfaction with the staff can be expected.

b. Processing of Requests for Changes to the Existing System

DMSSC is responsible for providing the support and services for the AQCESS system. Request for changes must go to DMSSC for approval and funding. If enough AQCESS sites request or support the change, then an upgrade to the system will be made. This upgrade, after testing, is then released as an improved version of the previous AQCESS system. The latest version for testing is AQCESS 7.0, which will take a year to release, if successful. (ADPAQCESS NMDSC, 1991) Because AQCESS is under centralized control (DMSSC), changes to AQCESS will not occur rapidly.

c. User's Understanding of the System

Users with better computer background and training are likely to be more confident in their ability to use the system and are more satisfied with the experience. The work groups that reported a low level of satisfaction in user training (physicians in particular) demonstrated a significantly lower level of satisfaction with their understanding of the system.

d. User's Feeling of Involvement

The presumption is that user involvement will lead to better understanding of the system and develop a system tailored to meet specific needs. Therefore, users will be more satisfied with the system than if they had not been involved. (Baroudi, Olson and Ives, 1986) Physicians are rarely involved with the system. So, their low of level satisfaction is expected. Consequently, administrative personnel are involved daily in the operations of the system and they feel involved with the system.

e. Relevancy of Output Information

When the output information is less than what the user perceives, the user will be less satisfied with the system (Conrath and Mignen, 1990). All groups have a low perception of the output information.

f. Accuracy of Output Information

Physicians often question the accuracy of their statistical performance reports. If the information is inaccurate, then the system may be more likely to be blamed for the mistake than the person who inputs the information. This may be the main source of discontent for the physicians.

g. Completeness of Output

The comprehensiveness of the output information relates to the relevancy and accuracy of the information. If the user perceives the information to be lacking, the user will more likely think the information is inaccurate and/or irrelevant. It is not surprising to find the administrative group scoring significantly higher than the other groups on this question. The administrative group does not use this information directly.

4. Grouped factors

The overall management of the AQCESS system is centrally controlled by DMSSC who are responsible for the software support for the system. Local support services are provided by the local MID. Therefore, the single factor, MID staff and services, found in the original study by Ives, Olson, and Baroudi (1988), was altered to make two separate factors: local MID staff and services and Contractor's services.

The physicians scored the four factors statistically significant lower and the administrative group scored the four factors statistically significant higher for level of satisfaction. As alluded to earlier, due to the physicians' limited role and involvement with the system, their low level of satisfaction is predictable. The administrative group is not as constrained for time as the ancillary group. They are more involved with the system and may have a higher level of satisfaction, but not significant.

It is noteworthy to examine the significant positive level of satisfaction towards the local MID staff and services. Although there was a statistically significant lower difference, the physicians' level of satisfaction for this factor was positive, the only factor to be scored positive by the physicians. The administrative and ancillary groups' satisfaction index indicated that they were very satisfied with the services provided by the local MID staff. Common sense would suggest that the level of satisfaction is directly related to effective communication (Conrath and Mignen, 1990). Thus, it can be reasonable to assume that the MID staff is effectively communicating with the ancillary and administrative group and, to a lesser degree, the physicians.

Bailey and Pearson (1983) listed contractor services and time required for system changes as the two most frequent elements for causing dissatisfaction among users. The outside services rendered by DMSSC were viewed unfavorably by the work

groups. DMSSC oversees 166 sites DoD wide. Each site has an AQCESS Customer Support Representative who is responsible for providing direct support of that user. A site has several means of reporting their problems; E-mail, System Change Requests (SCRs), work shops etc. (NMDSC, 1991) Any requests for changes to a system or its software, unless the change is critical, will be a lengthy process. Since most of the users are not familiar with the centralized process or DMSSC, it is only reasonable to expect the low level of satisfaction for this factor.

It appears that the users will be satisfied if the output information is accurate, comprehensive, reliable and relevant, the users' will be satisfied. The work group was slightly satisfied with the factor regarding the quality of output information delivered by the AQCESS system.

Powers and Dickson (1973) argues that no matter how effective a system might be, if it is not perceived to be satisfactory, it will be underutilized. AQCESS is training intensive and is not designed for the computer novice. Consequently, some of the features of the system are underutilized. (NMDSC, 1991) If that is the case, then a low level of satisfaction will be displayed by the users. The administrative and ancillary groups displayed a nearly neutral satisfaction index for the knowledge and involvement factor. The satisfaction index was negative for the physicians. The administrative group exhibited a satisfaction level which

showed a statistically significant higher difference than the other two groups. The administrative group can be considered slightly satisfied with this factor.

5. Satisfaction versus Time of System Use

In a study conducted by Igbaria and Nachman (1990), a significant relationship was found between user satisfaction and system utilization. This study showed an increase in overall satisfaction as time of system use increased. Then, the level of satisfaction decreases after extended use (greater than 11 months) of the system.

Initially, new personnel are preoccupied with learning the AQCESS system in order to learn their job. Once they have become comfortable and familiar with the AQCESS system, the users are more concerned with doing their job. Consequently, the users become more intolerant to system down time or slow response time. Also, as their knowledge of and experience with the system grows, they can more easily comprehend the reasons for system problems and only wonder why the experts can not fix them. Thus, their level of satisfaction for the system has decreased with time.

C. FORT ORD OVERALL SATISFACTION

A comparison of the satisfaction levels of the respondents from the Silas B. Hays Hospital will provide a baseline measure for future evaluations of the system.

1. Combined Groups

Fort Ord's average satisfaction index is 10.47. By referring to the index ranges of -39 to 39, the respondents' average overall satisfaction is classified as being only slightly satisfied.

2. Comparison of Work Groups

There were two work groups identified in this study, administrative and ancillary, instead of three because no Fort Ord physicians responded to the survey. (A spokesman stated that the physicians did not interact with the system.) There was no statistically significant difference between the work groups. However, the ancillary group was more satisfied than the administrative group. One problem with this assessment is that the ancillary group's surveyed population only composed approximately three and one half percent of the total respondent population as opposed to the administrative group's overwhelming 96.5 percent. Therefore, the ancillary group's results may not be an accurate representation of the actual group population as a whole.

Both administrative and ancillary personnel had very low regards for the timeliness of outside services and modifications to the system, as well as the amount of training they received. However, their collective satisfaction with the local IMD staff was considerably higher. The users appeared to recognize that the local staff was both willing

and capable of performing services which were not governed by higher authority.

3. Significant Individual Question Differences and Grouped factors

There was no statistically significant difference between the work groups for any of the responses to the individual questions or grouped factors. The ancillary group generally appeared to be more satisfied in the individual question areas as well as the four grouped factors. However, as suggested earlier, this may be attributed to the ancillary group's size.

4. Satisfaction Versus Time of System Use

The ancillary group only had users with six to 11 months of system use, however, their level of satisfaction was relatively high. The administrative group's level of satisfaction actually increased as the respondents' time of system use increased. This trend is consistent with that which was predicted in chapter VII. Many respondents equated experience with the system to being able to efficiently and effectively manipulate the system and further translated that to "job satisfaction".

D. PENSACOLA AND FORT ORD OVERALL SATISFACTION

A comparison of the satisfaction levels of the respondents from the both systems will further aid in future evaluations.

1. Combined Groups

Combining both Pensacola and Fort Ord 's work groups produces an average satisfaction index of 9.64. The results indicated that there was a low level of satisfaction among all AQCESS respondents.

2. Comparison of Work Groups

The work groups identified in this study, included both Pensacola's and Fort Ord's administrative and ancillary groups. The administrative group displayed the highest level of satisfaction, followed by the ancillary group. It has been established that the administrative group's use of the information is less critical than that of the ancillary group. As a result, they are less frustrated with slow response and down time of the system.

3. Significant Individual Question Differences and Grouped factors

The combined work groups at Pensacola showed a statistically significant higher difference than Fort Ord for question 2. It would appear that neither site is at all satisfied with the way in which outside contractors or DMSSC process requests for changes to the system. Some users expressed dissatisfaction over not having their requests honored in a timely manner. Others understood and agreed with the process involved in implementing changes. After all, if all requests were acknowledged and implemented, there would

probably be a number of unique AQCESS systems throughout DoD. There was no statistically significant differences regarding the grouped factors.

E. FORT ORD, PENSACOLA AND CHARLESTON OVERALL SATISFACTION

Current plans for AQCESS include many new initiatives. AQCESS 6.0 was tested and accepted by representatives from the three services in March, 1991. Expanded functions have been incorporated into AQCESS 7.0 which include scrolling help windows with "point and shoot", data entry from help tables and Ad Hoc Reporting. Beta testing is expected to begin the during the first quarter of fiscal year 1992. DoD funding has been established to support hardware upgrades at selected sites in fiscal years 1992 and 1993. Despite all these upgrades to the AQCESS system, scheduling in September and December of 1992 the AQCESS systems at Pensacola and Fort Ord will be replaced by the CHCS system. (NMDSC, 1991)

A comparison of the satisfaction levels of the respondents from the combined AQCESS systems and the CHCS system will aid in future evaluations.

1. Combined Groups

The survey average satisfaction index is 9.64. Charleston is more satisfied with their system than Fort Ord or Pensacola. Pensacola shows a less than average level of satisfaction. This may be attributed to the fact that the Pensacola physicians displayed a very low level of

satisfaction for the AQCESS system. The differences in the levels of satisfaction were not statistically significant.

2. **Significant Individual Question Differences and Grouped factors**

This section will only discuss those questions that were statistically significant.

a. Processing of Requests for Changes to the Existing System

All sites responded negatively. Charleston is less satisfied than the other sites and happens to be a beta test site for the CHCS system. Software support for this site is furnished by a civilian contractor. The CHCS system is a relatively new system under development, whereas the AQCESS system has been operational since 1984. The developers and service personnel of the AQCESS system have had the opportunity to identify and correct many software problems. The AQCESS systems' MID/IMD personnel are less concerned with system implementation and more concerned with system maintenance, so there are fewer requests for changes. Therefore, the users of the AQCESS system may be less frustrated.

b. Degree of Training Provided to Users

Charleston was more satisfied with their level of training than the other sites. Since Charleston was a test site and was in the implementation phase, the users' formal

training was more extensive than the other sites. Therefore, Charleston was expected to show a higher level of satisfaction.

c. User's Feeling of Participation

Charleston was more satisfied with their involvement with the CHCS system than the users of the AQCESS system. This can be expected, especially when comparing the physicians of both sites. The CHCS physicians use the system for direct patient care. In fact, the CHCS physicains have a terminal located in their office. Whereas, the AQCESS physicians' only legitimate way of interfacing with the system is by reviewing statistics of their performance compiled by the Quality Assurance personnel.

d. Attitude of the Information Management Staff

Charleston was more satisfied with the Information Management staff. Since they are a test site, the MID staff provided more recent and extensive training. The communication between the CHCS users and their staff was expected to be more satisfying.

e. Accuracy of Output Information

The accuracy of output information for the CHCS physicians, in many instances, is directly related to the information that they input. The AQCESS physicians have little or no control over the input information. Therefore,

it is reasonable to assume that the level of satisaction for CHCS users will be higher.

f. Factor A (Local MID/IMD Staff and Services)

Charleston shows a higher level of satisfaction. The CHCS users' perception of the local MID is considered to be quite satisfactory. There does not appear to be any communication problems between the CHCS users and the MID staff. The AQCESS users appear to be satisfied with the level of service from their MID/IMD staff, but to a lesser degree. The higher level of satisfaction for the CHCS group can be attributed to the increased communication required between them and their MID staff while undergoing testing of the system.

F. COMBINED CHCS AND AQCESS OVERALL SATISFACTION

The work groups from the AQCESS and the CHCS systems have been combined to pinpoint problems of a particular work group. The following sections will analyze the responses from the combined work groups.

1. Overall satisfaction

The overall satisfaction index was 10.14. This places the overall satisfaction index in the lower third of the scale. This score should be used as a baseline measure for follow-on analysis of these hospital information systems.

The ancillary and administrative groups, with comparable satisfaction indices, appear to be slightly

satisfied with their information systems. The physicians, with a near neutral satisfaction index, can be considered to be unsatisfied with the system.

2. **Significant Individual Questions**

The following section will only address those questions with statistically significant differences among the work groups. The individual questions will be combined into grouped factors and discussed in the next section.

a. Processing of Requests for Changes to Existing Systems

The administrative group shows a higher level of satisfaction. However the results show a neutral satisfaction index for the administrative group and negative satisfaction indices for the ancillary group and physicians. This implies that the work groups are dissatisfied with the contracted services, which is consistent with previous analysis.

b. Degree of Training Provided to Users

The physicians consistently demonstrated a lower level of satisfaction for training in all the previous comparisons. Clearly, this is an area for further study.

c. User's Understanding of Systems

The low level of satisfaction is evident among all work groups and, in particular, the physicians. This is consistent with previous findings that suggests users with

better computer background and training are more likely to be more satisfied with the system.

d. User's Feeling of Participation

As previously noted, the users who are more involved with the system gain a better understanding of the system. As a result, are more satisfied. In the case of the AQCESS physicians, they are rarely involved with the system. Contrarily, the CHCS physicians with terminals in their offices, may find the system to be a distraction from their daily routine. Thus, the physicians' negative satisfaction index indicates their dissatisfaction for their current level of participation.

e. Attitude of the Information Management Staff

For this item, the physicians indicated satisfaction with the system, even though they displayed a lower level than the other groups. This is the highest satisfaction index recorded by the physicians. The administrative and ancillary groups were highly satisfied with the attitude of their MID/IMD staffs.

f. Reliability of Output Information

The physicians are not satisfied with the reliability of output information. This can be attributed to their roles and involvement with their systems. The administrative and ancillary personnel are only slightly

satisfied. If the information is inconsistent, the users will have a low level of satisfaction.

g. Relevancy of Output Information (to Intended Function

The physicians perceived the output information as not being what they required. The administrative and ancillary groups were reasonably satisfied.

h. Time Required for New Systems Development

Contractor services and time required for system changes are viewed unfavorably by the work groups. Responses to requests for changes to information systems that are controlled by a central management (DMSSC) are more likely to be slower than responses for an information system that has a decentralized management.

i. Completeness of the Output Information

All groups show a positive satisfaction index. However, consistent with previous analysis, the physicians perceived the information to be incomplete. If the information is perceived to be inaccurate, irrelevant and inconsistent, users will not be satisfied with the output information.

3. Comparison of Grouped Factors

The physicians are significantly less satisfied for all factors. That could be, for the most part, due to combining the CHCS physician responses with those of the

AQCESS physicians. Although the sample populations for the two physician groups differ by only one, the extremely negative scores reported by the Pensacola group significantly influenced the overall low scores of the combined physician group. Nevertheless, the physicians tend to show a positive level of satisfaction for the MID/IMD staff and services along with the administrative and ancillary groups.

The analysis of the responses form the work groups for contractor services and time required for system changes are consistent with other analysis. The administrative and physician groups view the contractor services negatively, while the ancillary group is neutral. This was the most frequent cause of dissatisfaction for the users.

The administrative and ancillary groups were slightly satisfied with the quality of output delivered by the system. The physicians, however, were dissatisfied.

The physicians were dissatisfied with knowledge of and involvement with the system. If users are lacking in training, understanding, and experience with the system, they are more likely to be less satisfied.

XII. CONCLUSIONS AND RECOMMENDATIONS

A. MEASURING USER INFORMATION SATISFACTION

Today, there is a greater need to understand the user's point of view. As the availability of hardware and software continues to grow, it becomes more difficult to remain current with the pace of technological changes. Because of personal computing, users are far more knowledgeable. They are less tolerant of complex time-consuming processes and procedures, delays due to backlogs and shifting priorities and inadequate procedures and information on available resources. (Conrad and Mignen, 1990, Cash et al, 1988, Mensching and Adams, 1991) Conrad and Mignen (1988) argue that the focus should not be on the cure for user dissatisfaction, but to develop the means to identify problems before they occur. This is almost impossible without some means of gauging users' perceptions. The user information satisfaction survey questionnaire provides the means for gauging users' perceptions. The survey questionnaire is easily and quickly administered and provides a standard measure for comparisons of scores across departments, systems, users, organizations, and industries. This survey is not a conclusive evaluation of the AQCESS and CHCS systems, but coupled with further investigation, can be

a powerful tool in the analysis and interpretation of the causes of user dissatisfaction.

B. SATISFACTION CHARACTERISTICS OF AQCESS

Overall satisfaction is a generalization of all the characteristics that effect the satisfaction of the user. Along with overall satisfaction, the study specifically looked at the four factors that make up satisfaction.

1. Overall Satisfaction

The survey results indicate the users are slightly satisfied with AQCESS at Silas B. Hays Army Hospital, Fort Ord, and by Naval Hospital, Pensacola. The physicians' responses were consistently scored low across CHCS and AQCESS. The lack of Fort Ord physician responses to the survey may have caused a slightly inflated overall satisfaction score for them. The overall satisfaction scores across organizations and systems did not differ significantly.

2. Areas of Satisfaction

All three work groups (to a lessor extent the physicians) rated the local MID/IMD staff and services as being satisfactory. However, the CHCS users' satisfaction index is twice that of the AQCESS users'. This suggests that the local AQCESS MID/IMD personnel are not communicating and interacting with their users as effectively as the CHCS MID personnel are with their users. CHCS's success in this area can be attributed to the emphasis on training the users during

the implementation phase of the CHCS system. The AQCESS systems' MID/IMD personnel, far beyond the implementation phase, have no need to intensify the training of their users. However, they do maintain a solid steady training program that includes both formal and on-the-job training.

In many areas, the AQCESS systems' administrative groups displayed higher satisfaction than any other group. The ancillary groups, whose interaction with the system is more essential (regarding direct patient care), were more dissatisfied because of the system's response time.

3. Areas of Dissatisfaction

Armed with a set of problem areas, the MID/IMD staff and functional managers of the AQCESS systems can explore the underlining causes through: (1) interviews and (2) by examining the development and operating procedures of particular user groups within their systems. Investigation into areas of dissatisfaction can provide context, history and insight for possible corrective measures.

Since the physicians' satisfaction indices were low, across the organizations, it seems to be a characteristic of physicians to display a low level of satisfaction for hospital information systems. The limited involvement of the Pensacola physicians was a major factor for their overall low level of satisfaction.

The respondents were most dissatified with the amount of time it took for new system development and changes to occur. AQCESS is a centrally managed information system, therefore it requires a relatively long time to process requests for changes.

4. Satisfaction with Time of System Use

Regression analysis revealed no correlation between satisfaction and time of system use. The Fort Ord administrative group displayed increased satisfaction with increased time of use. All Pensacola groups, with greater than 11 months of experience, were less satisfied.

C. RECOMMENDATIONS

The short-form questionnaire developed by Baroudi and Orlikowski (1988) is an effective means to measure user information satisfaction. This survey instrument is an appropriate instrument to document user satisfaction within Medical Treatment Facilities as well as documenting changes in user satisfaction at Naval Hospitals, Pensacola and Silas B. Hays (Army) Hospital at a later time.

This type of survey, to prevent biased results, is best conducted by a researcher who is not experienced with the system. Thus, the interpretation of the results are more likely to reflect impartiality. It is recommended that the researcher arranges with a member of the organization to serve as a point of contact. The contact distributes and collects

the questionnaires for the researcher. It should be emphasized prior to the survey that the questionnaire elicits responses reflective of the present conditions and not the past conditions and experiences with information systems or MID/IMD staffs. In employing the user satisfaction questionnaire, it was found that some individuals were uncertain as to the exact meaning of certain questions. If the lack of clarity is likely to be a problem, it is recommended that full explanations of the scales be included. Additionally, direct contact with individuals for interview by the researcher is beneficial for adding context to history. Additionally, the following is recommended prior to conducting the interview:

1. Structure the interviews around known problem areas to avoid "orienting" time spent in searching for real issues.
2. Avoid focusing on the highly specific, idiosyncratic complaints of individual users that are not of general concern.
3. Reduce the number of interviews needed to obtain deeper undertsanding of the problem areas.

To obtain a deeper understanding of the issues by adding context to history, it is also recommended that the following items be further investigated:

1. The administrative group's overall higher satisfaction over the other work groups.
2. The physicians' lowered perception of satisfaction in almost all areas.
3. The reasons for the respondents having negative perceptions of satisfaction with contractor's services.

The user satisfaction questionnaire should be used as a standard measuring tool. This tool will allow both the researcher and the practitioner to utilize a readily available instrument, thus, avoiding the process of developing a new measure each time an assessment of user satisfaction is required. A follow on study should be conducted at Silas B, Hays Hospital, Fort Ord and Naval Hospital, Pensacola, using the results of this study as a baseline comparison. Finally, the results of this study should be used for measuring user satisfaction at other DoD hospital sites.

APPENDIX A

Part A: General Information

1. Hospital Division/Department: (Check one)
   - ____ General Administration
   - ____ Nursing Administration
   - ____ Dietary
   - ____ Emergency
   - ____ Laboratory
   - ____ Medical Clinic
   - ____ Inpatient Nursing
   - ____ Pharmacy
   - ____ Radiology
   - ____ Other (Specify):_____

2. Job Description: (Check one)
   - ____ Administration
   - ____ Medic
   - ____ Technician
   - ____ Nurse
   - ____ Pharmacist
   - ____ Physician
   - ____ Physician Assistant
   - ____ Other (Specify):_____

3. Highest Level of Education: (Check one)
   - ____ High School Graduate
   - ____ Some College
   - ____ Associate's Degree
   - ____ Bachelor's Degree
   - ____ Some Graduate Work
   - ____ Master's Degree
   - ____ Doctoral Degree
   - ____ Medical Degree
   - ____ Other (Specify):_____

4. Age: ____

5. Gender: ____ Male ____ Female

6. Length of time (in months) you have used AQCESS: ____

7. Have you used other computer systems before ? ____ Yes ____ No

8. If your answer was Yes to question 7, was it a health care information system ? ____ Yes ____ No

Part B: User Satisfaction Questionnaire

This section conveys your personal feelings concerning the use of the Automated Quality of Care Support System at Naval Hospital, Pensacola / Silas B. Hays Hospital (Fort Ord). Please do not attempt to analyze the questions. Remember, there are no right or wrong answers.

Please follow these instructions:

1. Check each scale in the position that describes your evaluation or answer. Example: Inventor of the traffic light

   genius :_1__:____:____:__2_:____:____:__3_: incompetent

   You would check an "X" in the left-hand side of the scale (marked as "1" in the above example) if you thought the inventor was a genius. Similarly, you would mark the mid-point of the scale ("2" in the above example) if you thought the inventor was neither a total genius nor totally incompetent and the right-hand side (point "3" in the above scale) if you thought the inventor was incompetent. The other positions can be used to indicate varying degrees between "1" and "2" or "2" and "3".

2. Check in the space, not between spaces (be sure to check only one position per scale).
   (Correct way → :_x_: Incorrect way → :___x___:)
3. Check both of the scales after each question.
4. Work rapidly, do not omit any questions and rely on your first impressions.

ANSWERS BASED ON YOUR OWN OPINIONS

1. **Relationship with the Management Information Department (MID) Information Management Division (IMD) staff**
   dissonant :____:____:____:____:____:____:____: harmonious
   bad :____:____:____:____:____:____:____: good

2. **Processing of requests for changes to existing systems**
   fast :____:____:____:____:____:____:____: slow
   untimely :____:____:____:____:____:____:____: timely

3. **Degree of training provided to users**
   complete :____:____:____:____:____:____:____: incomplete
   low :____:____:____:____:____:____:____: high

4. **User's understanding of systems**
   insufficient :____:____:____:____:____:____:____: sufficient
   complete :____:____:____:____:____:____:____: incomplete

5. User's feeling of participation

positive :____:____:____:____:____:____:____: negative
insufficient :____:____:____:____:____:____:____: sufficient

6. Attitude of the Management Information Department / Information Management Division staff

cooperative :____:____:____:____:____:____:____: belligerent
negative :____:____:____:____:____:____:____: positive

7. Reliability of output information

high :____:____:____:____:____:____:____: low
superior :____:____:____:____:____:____:____: inferior

8. Relevancy of output information (to intended function)

useful :____:____:____:____:____:____:____: useless
relevant :____:____:____:____:____:____:____: irrelevant

9. Accuracy of output information

inaccurate :____:____:____:____:____:____:____: accurate
low :____:____:____:____:____:____:____: high

10. Precision of output information

low :____:____:____:____:____:____:____: high
definite :____:____:____:____:____:____:____: uncertain

11. Communication with the Management Information Department / Information Management Division staff

dissonant :____:____:____:____:____:____:____: harmonious
destructive :____:____:____:____:____:____:____: productive

12. Time required for new systems development

unreasonable :____:____:____:____:____:____:____: reasonable
acceptable :____:____:____:____:____:____:____: unacceptable

13. Completeness of the output information

sufficient :____:____:____:____:____:____:____: insufficient
adequate :____:____:____:____:____:____:____: inadequate

Thank you again for your cooperation

APPENDIX B

Automated Quality of Care Evaluation Support System Survey

This survey is part of a study of the Automated Quality of Car Evaluation Support System (AQCESS) and its effectiveness in military hospital settings. The purpose of the study is to obtain information regarding your perceptions or views of how well AQCESS functions in your specific area of use.

Just a few minutes are required to fill out general informatio along with a 13 question survey. Your identity will remain confidential. The data gathered through the survey will provide valuable insight into the system's strengths and/or weaknesses as well as assist in future research, development and training.

The success of this survey depends on my receiving as many completed surveys as possible from users in all hospital areas. Your participation lends an important contribution towards this end. There are no right or wrong answers, only your candid response to each question. Please do not omit any of the question in either section of the survey.

Please return your completed survey to LCDR Neeley in the Management Information Department / Mr. G. Scott (HSXT-IMD) in the envelope provided. Thank you for your cooperation.

James R. Booth, LCDR, USN / John L. Bryant, Jr., LT, US
Naval Postgraduate School
SMC 1073 / SMC 2604
Monterey, CA 93940-4831

APPENDIX C-1

NAVAL HOSPITAL PENSACOLA

COMBINED RESULTS FOR PHYSICIANS VS ANCILLARY VS ADMINISTRATIVE

TOTAL SATISFACTION	AVERAGE	INDEX
PHYSICIAN	-0.3899	-4.15909
ADMIN	1.42659	12.83929
ANCILLARY	0.72624	11.49265

GROUP FACTORS	A (MID)	A (CON)	B	C
PHYSICIAN SAT	0.64394	-0.76136	-0.4955	-1.01136
ANCILLARY SAT	1.41176	0.003676	0.70882	0.376838
ADMIN SAT	1.7123	0.309524	1.00357	0.59375
PHYSICIAN STDEV	1.43618	1.538883	1.53888	1.595408
ANCILLARY STDEV	1.52979	1.694494	1.73813	1.816868
ADMIN STDEV	1.44426	1.76929	1.69909	1.828224

INDIVIDUAL QUESTION RESPONSES

QUESTION	1	2	3	4	5
PHYSICIAN	0.63636	-1.04545	-1	-0.75	-1.25
ANCILLARY	1.5	-0.09504	0.13971	0.69117	0.82353
ADMIN	1.72024	0.309524	0.19048	0.95833	0.91667

STAN DEV	1	2	3	4	5
PHYSICIAN	1.58245	1.445283	1.43019	1.79804	1.63936
ANCILLARY	1.53872	1.800855	1.85968	1.75530	1.67104
ADMIN	1.40121	1.883362	1.81578	1.80394	1.67053

QUESTION	6	7	8	9	10
PHYSICIAN	0.5	-0.61364	-0.6591	-0.4772	-0.3182
ANCILLARY	1.39706	0.941176	0.91176	0.61029	0.35294
ADMIN	1.88095	0.952381	1.30357	0.97023	0.68452

STAN DEV	6	7	8	9	10
PHYSICIAN	1.58831	1.555283	1.46075	1.42204	1.60642
ANCILLARY	1.57312	1.670526	1.67363	1.73702	1.68265
ADMIN	1.41762	1.76544	1.52268	1.72318	1.70133

QUESTION	11	12	13
PHYSICIAN	0.79545	-0.47727	-0.4091
ANCILLARY	1.33824	0.154412	0.72794
ADMIN	1.53571	0.213178	1.10714

STAN DEV	11	12	13
PHYSICIAN	1.057	1.097283	1.61412
ANCILLARY	1.4714	1.566556	1.85293
ADMIN	1.49161	1.647337	1.85293

APPENDIX C-2

NAVAL HOSPITAL PENSACOLA

PHYSICIANS VS THE REST OF THE SURVEY GROUP

GENERAL	AVERAGE	INDEX
PHYSICIAN	-0.3899	-4.1591
STDEV	1.62264	9.4067
NON-PHYSICIAN	0.8707	13.7796
STDEV	1.75216	20.3155

GROUP FACTORS	A (MID)	A (CON)	B	C
PHYSICIAN GROUP	0.64394	-0.76140	-0.49550	-1.0114
NON-PHYSICIAN	1.57785	0.17270	0.87171	0.49671
PHYSICIAN STDEV	1.43618	1.31421	0.28359	0.31756
NON-PHYSICIAN STDEV	1.49064	1.74287	1.72291	1.82634

QUESTION	1	2	3	4	5
PHYSICIAN SAT	0.63636	-1.04550	-1.0000	-0.7500	-1.2500
PHYSICIAN STDEV	1.58245	1.44528	1.4301	1.7980	1.63936
NON-PHYSICIAN SAT	1.62171	0.10526	0.1677	0.8388	0.87500
NON-PHYSICIAN STD	1.46841	1.86081	1.8357	1.7872	1.67140

QUESTION	6	7	8	9	10
PHYSICIAN SAT	0.50000	-1.0455	-1.0000	-0.6136	-0.3182
PHYSICIAN STDEV	1.58831	1.55528	1.4607	1.4220	1.49033
NON-PHYSICIAN SAT	1.66447	0.94737	1.1282	0.8092	0.53618
NON-PHYSICIAN STD	1.50850	1.72363	1.6038	1.7386	1.70101

QUESTION	11	12	13
PHYSICIAN SAT	0.79545	-0.47730	-0.4091
PHYSICIAN STDEV	1.05700	1.09728	1.61412
NON-PHYSICIAN SAT	1.44737	0.24013	0.8914
NON-PHYSICIAN STD	1.48585	1.61354	1.78611

APPENDIX C-3

PHYSICIANS vs THE REST OF THE SURVEY GROUP

CALCULATED T-VALUE	
1	2.91074*
2	2.78081*
3	2.86054*
4	3.89161*
5	5.73435*
6	3.34561*
7	5.13898*
8	5.89105*
9	3.60145*
10	2.24833*
11	2.00319*
12	2.02872*
13	3.22161*

FACTOR	
A(MID)	2.77688*
A(CON)	2.41541*
B	3.71987*
C	3.91692*

OVERALL 4.07910*

* SIGNIFICANT AT ALPHA = .05

APPENDIX C-4

NAVAL HOSPITAL PENSACOLA

ANCILLARY VS THE REST OF THE SURVEY GROUP

GENERAL	AVERAGE	INDEX
ANCILLARY	0.72624	11.49265
NON-ANCILLARY	0.70174	9.311321
ANCILLARY STDEV	1.75436	21.45832
NON-ANCILLARY STDEV	1.80618	14.53046

GROUP FACTORS	A (MID)	A (CON)	B	C
ANCILLARY	1.41176	0.003676	0.70882	0.376838
NON-ANCILLARY	1.49057	0.087264	0.69245	0.175393
ANCILLARY STDEV	1.52979	1.694494	1.73813	1.788388
NON-ANCILLARY STDEV	1.50625	1.740047	1.76784	1.897845

QUESTIONS	1	2	3	4	5
ANCILLARY	1.5	-0.14706	0.13971	0.69117	0.82353
NON-ANCILLARY	1.49528	0.028302	-0.0566	0.60377	0.46698
ANCILLARY STDEV	1.53872	1.800855	1.85968	1.75530	1.67104
NON-ANCILLARY STDEV	1.50627	1.883181	1.80842	1.93126	1.88185

QUESTIONS	6	7	8	9	10
ANCILLARY	1.39706	0.941176	0.91176	0.61029	0.82353
NON-ANCILLARY	1.59434	0.627358	0.89623	0.66981	0.47642
ANCILLARY STDEV	1.57312	1.670526	1.67363	1.73702	1.68265
NON-ANCILLARY STDEV	1.55877	1.837196	1.70697	1.76561	1.73053

QUESTIONS	11	12	13
ANCILLARY	1.33471	0.154412	0.72794
NON-ANCILLARY	1.38208	0.146226	0.79245
ANCILLARY STDEV	1.4714	1.566556	1.85293
NON-ANCILLARY STDEV	1.444	1.581835	1.79998

APPENDIX C-5

ANCILLARY vs THE REST OF THE SURVEY GROUP

CALCULATED T-VALUE	
1	0.00000
2	0.62229
3	-0.69054
4	-0.30014
5	-1.25072
6	0.78195
7	-1.12362
8	0.22088
9	0.21962
10	-1.27920
11	0.22167
12	0.23056
13	0.21223

FACTOR	
A(MID)	0.34149
A(CON)	0.31046
B	-0.03660
C	-0.69144

OVERALL -1.50880

* SIGNIFICANT AT ALPHA = .05

APPENDIX C-6

NAVAL HOSPITAL PENSACOLA

ADMINISTRATIVE VS THE REST OF THE SURVEY GROUP

GENERAL	AVERAGE	INDEX
ADMIN SAT	0.98764	12.83929
NON-ADMIN SAT	0.45342	7.666667
ADMIN STDEV	1.74163	13.53834
NON-ADMIN STDEV	1.78861	20.36609

GROUP FACTORS	A (MID)	A (CON)	B	C
ADMIN	1.7123	0.309524	0.98148	0.59375
NON-ADMIN	1.22407	-0.18333	0.41444	0.0375
ADMIN STDEV	1.44426	1.76929	1.69909	1.828224
NON-ADMIN STDEV	1.54314	1.643083	1.769	1.863385

QUESTIONS	1	2	3	4	5
ADMIN SAT	1.72024	0.309524	0.19048	0.95833	0.91667
NON-ADMIN SAT	1.28889	-0.36667	-0.1389	0.33888	0.31667
ADMIN STDEV	1.40121	1.883362	1.81578	1.80394	1.67053
NON-ADMIN STDEV	1.59335	1.763519	1.8311	1.87131	1.88702

QUESTIONS	6	7	8	9	10
ADMIN SAT	1.88095	0.952381	1.30357	0.97023	0.68452
NON-ADMIN SAT	1.17778	0.561111	0.52778	0.34444	0.18889
ADMIN STDEV	1.41762	1.76544	1.52268	1.72318	1.70133
NON-ADMIN STDEV	1.62329	1.773772	1.75888	1.72987	1.68914

QUESTIONS	11	12	13
ADMIN SAT	1.53571	0.309524	1.10714
NON-ADMIN SAT	1.20556	0.096939	0.45
ADMIN STDEV	1.49161	1.647337	1.71143
NON-ADMIN STDEV	1.40118	1.490712	1.86272

APPENDIX C-7

ADMINISTRATIVE vs THE REST OF THE SURVEY GROUP

CALCULATED T-VALUE		
1	-1.88791	
2	-2.46426	*
3	-1.19177	
4	-2.22523	*
5	-2.21289	*
6	-3.02213	*
7	-1.45634	
8	-3.07875	*
9	-2.40038	*
10	-1.90959	
11	-1.50105	
12	-0.92410	
13	-2.43150	*
FACTOR		
A(MID)	-2.16394	*
A(CON)	-1.89548	*
B	-2.16356	*
C	-0.07198	*
OVERALL	-1.45925	

* SIGNIFICANT AT ALPHA = .05

APPENDIX C-8

NAVAL HOSPITAL PENSACOLA

ANCILLARY VS ADMINISTRATIVE GROUP

GENERAL	AVERAGE	INDEX
ANCILLARY SAT	0.72624	13.73530
ADMIN SAT	0.98764	13.81550
ANCILLARY STDEV	1.75436	25.13573
ADMIN STDEV	1.74163	15.34150

GROUP FACTORS	A	A	B	C
	(MID)	(CON)		
ANCILLARY SAT	1.41176	0.003676	0.70882	0.37684
ADMIN SAT	1.71230	0.30952	0.98148	0.59375
ANCILLARY STDEV	1.52979	1.694494	1.73813	1.78839
ADMIN STDEV	1.44426	1.76929	1.69909	1.82822

QUESTIONS	1	2	3	4	5
ANCILLARY SAT	1.50000	-0.14710	0.13971	0.69118	0.82353
ADMIN SAT	1.72024	0.30952	0.19048	0.95833	0.91667
ANCILLARY STDEV	1.53872	1.80086	1.85968	1.75531	1.67104
ADMIN STDEV	1.40121	1.88336	1.81578	1.80394	1.67053

QUESTIONS	6	7	8	9	10
ANCILLARY SAT	1.39706	0.94118	0.91176	0.61029	0.82353
ADMIN SAT	1.88095	0.95238	1.30357	0.97024	0.68452
ANCILLARY STDEV	1.57312	1.67053	1.67363	1.73702	1.68265
ADMIN STDEV	1.41762	1.76544	1.52268	1.72318	1.70133

QUESTIONS	11	12	13
ANCILLARY SAT	1.33471	0.15441	0.72794
ADMIN SAT	1.53571	0.30952	1.10714
ANCILLARY STDEV	1.47140	1.56656	1.85293
ADMIN STDEV	1.49161	1.64734	1.71143

APPENDIX C-9

ANCILLARY vs ADMINISTRATIVE GROUP

CALCULATED T-VALUE

1	0.84816
2	1.51933
3	1.66100
4	0.93099
5	0.36708
6	2.05345 *
7	0.03501
8	1.38279
9	1.27973
10	-0.50710
11	0.81736
12	0.56945
13	1.31714

FACTOR	
A(MID)	0.03318
A(CON)	1.08134
B	0.97679
C	0.68113

OVERALL 0.030183

* SIGNIFICANT AT ALPHA = .05

APPENDIX C-10

NAVAL HOSPITAL PENSACOLA

SATISFACTION BASED ON TIME ON THE SYSTEM

OVERALL

# PEOPLE	TIME OF USE	AVG SAT
35	1 TO 5	11.94
34	6 TO 11	12.66
104	>= 12	7.58
174		

ADMINISTRATIVE

# PEOPLE	TIME OF USE	AVG SAT
19	1 TO 5	15.16
17	6 TO 11	16.07
48	>= 12	10.99
84		

ANCILLARY

# PEOPLE	TIME OF USE	AVG SAT
12	1 TO 5	9.96
13	6 TO 11	13.71
43	>= 12	9.45
68		

PHYSICIANS

# PEOPLE	TIME OF USE	AVG SAT
4	1 TO 5	10.07
4	6 TO 11	3.54
14	>= 12	6.36
22		

APPENDIX D-1

SILAS B. HAYS ARMY HOSPITAL

COMBINED RESULTS FOR ADMINISTRATIVE AND ANCILLARY

TOTAL SATISFACTION	AVERAGE	INDEX
ADMIN	0.79860	10.38182
STAN DEV	1.76524	15.80275
ANCILLARY	1.00000	13.00000
STAN DEV	1.42774	13.50000

GROUP FACTORS	A (MID)	A (CON)	B	C
ADMIN AVG	1.27878	0.05909	0.94545	0.34545
ANCILLARY AVG	1.54545	0.37500	0.90000	0.87500
ADMIN STDEV	1.74456	1.76356	1.67894	1.77449
ANCILLARY STDEV	1.83031	2.34187	1.17898	1.72753

COMBINED GROUP FACTORS	A (MID)	A (CON)	B	C
AVERAGE	1.28739	0.07017	0.94386	0.36403
STAN DEV	1.73276	1.78796	1.66396	1.77554

INDIVIDUAL QUESTION RESPONSE

QUESTION	1	2	3	4	5
ADMIN	1.22727	-0.31818	0.118182	0.90909	0.67272
ANCILLARY	1.50000	0	0.750000	1.50000	1.25000

STAN DEV	1	2	3	4	5
ADMIN	1.72499	1.73169	1.73588	1.56405	1.79448
ANCILLARY	1.50000	3.00000	0.829156	0.50000	0.82915

QUESTION	6	7	8	9	10
ADMIN	1.15454	0.95454	1.20909	0.91818	0.80000
ANCILLARY	1.66666	1.25000	1.50000	0	1.00000

STAN DEV	6	7	8	9	10
ADMIN	1.82501	1.691618	1.65746	1.70630	1.58286
ANCILLARY	0.47140	0.829156	0.50000	1.41421	1.00000

QUESTION	11	12	13
ADMIN	1.45454	0.43636	0.84545
ANCILLARY	1.50000	0.75000	0.75000

STAN DEV	11	12	13
ADMIN	1.66589	1.71372	1.72250
ANCILLARY	1.50000	1.29903	1.29903

APPENDIX D-2

ANCILLARY vs ADMINISTRATIVE

CALCULATED T-VALUE	
1	-0.22114
2	-0.24072
3	-0.50956
4	-0.52982
5	-0.45345
6	-0.40038
7	-0.24837
8	-0.25320
9	0.75420
10	-0.17685
11	-0.04192
12	-0.25435
13	0.07299

FACTOR	
A(MID)	-0.16331
A(CON)	-0.24566
B	0.04106
C	-0.40956

OVERALL -0.23099

* SIGNIFICANT AT ALPHA = .05

APPENDIX D-3

SILAS B. HAYS ARMY HOSPITAL

SATISFACTION BASED ON TIME OF USE

OVERALL

# PEOPLE	TIME OF USE	AVG SAT
12	1 TO 5	5.291667
11	6 TO 11	11.22727
34	>= 12	12.05882
57		

ADMINISTRATIVE

# PEOPLE	TIME OF USE	AVG SAT
12	1 TO 5	5.291667
9	6 TO 11	10.83333
34	>= 12	12.05882
55		

ANCILLARY

# PEOPLE	TIME OF USE	AVG SAT
0	1 TO 5	N/A
2	6 TO 11	13
0	>= 12	N/A
2		

APPENDIX E-1

NAVAL HOSPITAL PENSACOLA AND SILAS B. HAYS ARMY HOSPITAL FT. ORD
COMBINED RESULTS

OVERALL	QUESTION	INDEX
AVERAGE	0.7345987	9.636364
STAND DEV	1.7789492	14.83246

TOTAL SATISFACTION	QUESTION	INDEX
PHYSICIAN	-0.38986	-4.15909
STAND DEV	1.6226442	9.406703
ADMIN	0.912839	11.86691
STAND DEV	1.753449	14.52653
ANCILLARY	0.7340659	9.464789
STAND DEV	1.7464702	14.38562

GROUP FACTORS	A (MID)	A (CON)	B	C
PHYSICIAN SAT	0.0606061	-0.76136	-0.49545	-1.01136
ANCILLARY SAT	1.4119048	0.252381	0.714286	0.391071
ADMIN SAT	1.5407674	0.210432	0.980576	0.495504
PHYSICIAN STDEV	1.4361806	1.538883	1.538883	1.595408
ANCILLARY STDEV	1.524202	1.717497	1.724967	1.816273
ADMIN STDEV	1.5842124	1.771263	1.691382	1.81123
OVERALL AVG	1.4163059	0.058442	0.759307	0.320346
OVERALL STDEV	1.573773	1.739173	1.717359	1.845252

INDIVIDUAL QUESTION RESPONSES

QUESTION	1	2	3	4	5
PHYSICIAN	0.6363636	-1.04545	-1	-0.75	-1.25
ANCILLARY	1.5	-0.14286	0.157143	0.714286	0.835714
ADMIN	1.5251799	0.061151	0.161871	0.938849	0.820144

STAN DEV	1	2	3	4	5
PHYSICIAN	1.582445	1.445283	1.430194	1.798042	1.63936
ANCILLARY	1.5376234	1.846121	1.841084	1.737345	1.654478
ADMIN	1.5562866	1.850491	1.784945	1.713216	1.724774

QUESTION	6	7	8	9	10
PHYSICIAN	0.5	-0.61364	-0.65909	-0.47727	-0.31818
ANCILLARY	1.3928571	0.95	0.928571	0.592857	0.371429
ADMIN	1.5935252	0.953237	1.266187	0.94964	0.730216

STAN DEV	6	7	8	9	10
PHYSICIAN	1.5883096	1.555283	1.460747	1.422045	1.606418
ANCILLARY	1.5569954	1.653244	1.654616	1.731624	1.670513
ADMIN	1.6304966	1.736606	1.684424	1.716713	1.656431

QUESTION	11	12	13
PHYSICIAN	0.7954545	-0.47727	-0.40909
ANCILLARY	1.3428571	0.171429	0.728571
ADMIN	1.5035971	0.359712	1.003597

STAN DEV	11	12	13
PHYSICIAN	1.0570015	1.097283	1.614116
ANCILLARY	1.4724684	1.562703	1.839421
ADMIN	1.5634039	1.67507	1.839421

APPENDIX E-2

AQCESS FT ORD vs AQCESS PENSACOLA

OVERALL	QUESTION	INDEX
PENSACOLA	0.71132	9.02586
FT ORD	0.80567	10.47368
PENSACOLA STDEV	1.78615	14.93465
FT ORD STDEV	1.75489	15.73504

GROUP FACTORS	A (MID)	A (CON)	B	C
PENSACOLA	0.89719	0.05452	0.69885	0.30582
FT ORD	1.28363	-0.03955	0.94386	0.36403
PENSACOLA STDEV	1.51598	1.72164	1.76039	1.86665
FT ORD STDEV	1.13162	1.77987	1.65140	1.77555

INDIVIDUAL QUESTION RESPONSES

QUESTION	1	2	3	4	5
PENSACOLA	1.49713	-0.04011	0.02012	0.63793	0.60632
FT ORD	1.23684	-0.30702	0.14035	0.92998	0.69299

STAN DEV	1	2	3	4	5
PENSACOLA	1.51903	1.85706	1.83113	1.86497	1.81078
FT ORD	1.71834	1.79242	1.71616	1.54306	1.77273

QUESTION	6	7	8	9	10
PENSACOLA	1.51724	0.75000	0.90210	0.64655	0.42816
FT ORD	1.15789	0.96491	1.21930	0.88596	0.80702

STAN DEV	6	7	8	9	10
PENSACOLA	1.56735	1.78052	1.69403	1.75474	1.71304
FT ORD	1.79951	1.66980	1.63170	1.70530	1.56652

QUESTION	11	12	13
PENSACOLA	1.36494	0.14943	0.76724
FT ORD	1.45614	0.44444	0.84211

STAN DEV	11	12	13
PENSACOLA	1.45492	1.57589	1.82113
FT ORD	1.66038	1.65018	1.70951

APPENDIX E-3

AQCESS FT ORD vs AQCESS PENSACOLA

CALCULATED T-VALUE	
1	-1.65958
2	0.92434
3	-0.43705
4	-1.06333
5	-0.32762
6	-1.34927
7	-0.82097
8	-1.17281
9	-0.86718
10	-0.47880
11	-0.26139
12	-1.17853
13	0.37824

FACTOR	
A(MID)	-1.84777
A(CON)	0.32150
B	-0.75588
C	-0.17464

OVERALL -0.11841

* SIGNIFICANT AT ALPHA = .05

APPENDIX F-1

AQCESS SILAS B. HAYS ARMY HOSPITAL FT ORD, CA VS AQCESS NAVAL HOSPITAL PENSACOLA, FL VS CHCS NAVAL HOSPITAL CHARLESTON, SC

TOTAL SATISFACTION	QUESTION	INDEX
PENSACOLA	0.71132	9.02586
FT ORD	0.80567	10.47368
CHARLESTON	0.86558	11.25248
PENSACOLA STDEV	1.78610	14.93465
FT ORD STDEV	1.75489	15.73504
CHARLESTON STDEV	1.65718	11.73883

GROUP FACTORS	A (MID)	A (CON)	B	C
PENSACOLA	0.89719	0.05452	0.69885	0.30582
FT ORD	1.28363	-0.03955	0.94386	0.36403
CHARLESTON	1.77288	-0.35891	0.77607	0.52847
PENSACOLA STDEV	1.51598	1.72164	1.76039	1.86665
FT ORD STDEV	1.13162	1.77987	1.65140	1.77555
CHARLESTON STDEV	1.17591	1.75196	1.51405	1.80255

INDIVIDUAL QUESTION RESPONSES

QUESTION	1	2	3	4	5
PENSACOLA	1.49713	-1.04011	0.02012	0.63793	0.60632
FT ORD	1.23684	-0.30702	0.14035	0.92998	0.69299
CHARLESTON	1.67822	-0.50000	0.57426	0.97525	1.06436

STAN DEV	1	2	3	4	5
PENSACOLA	1.51903	1.85706	1.83113	1.86497	1.81078
FT ORD	1.71834	1.79242	1.71616	1.54306	1.77273
CHARLESTON	1.26586	1.75133	1.74690	1.67640	1.60559

QUESTION	6	7	8	9	10
PENSACOLA	1.51724	0.75000	0.90210	0.64655	0.42816
FT ORD	1.15789	0.96491	1.21930	0.88596	0.80702
CHARLESTON	1.98515	0.79208	0.94060	1.16832	0.54455

STAN DEV	6	7	8	9	10
PENSACOLA	1.56735	1.78052	1.69403	1.75474	1.71304
FT ORD	1.79951	1.66980	1.63170	1.70530	1.56652
CHARLESTON	1.04371	1.49837	1.43046	1.55541	1.18394

QUESTION	11	12	13
PENSACOLA	1.36494	0.14943	0.76724
FT ORD	1.45614	0.44444	0.84211
CHARLESTON	1.65347	-0.21287	0.59406

STAN DEV	11	12	13
PENSACOLA	1.45492	1.57589	1.82113
FT ORD	1.66038	1.65018	1.70951
CHARLESTON	1.18394	1.74471	1.48745

APPENDIX F-2

CHCS VS AQCESS

TOTAL SATISFACTION	QUESTION	INDEX
CHCS	0.86558	11.25248
AQCESS	0.73459	10.13203
CHCS STDEV	1.65718	11.73883
AQCESS	1.77895	16.68588

GROUP FACTORS	A (MID)	A (CON)	B	C
CHCS	1.77288	-0.35891	0.77607	0.52847
AQCESS	0.89898	0.05844	0.75931	0.32035
CHCS STDEV	1.17591	1.75196	1.51405	1.80255
AQCESS STDEV	1.57377	1.73917	1.74030	1.84525

INDIVIDUAL QUESTION RESPONSES

QUESTION	1	2	3	4	5
CHCS	1.67822	-0.50000	0.57426	0.97525	1.06436
AQCESS	1.43290	-0.10606	0.04978	0.70996	0.62771

STAN DEV	1	2	3	4	5
CHCS	1.26586	1.75133	1.74690	1.67640	1.60559
AQCESS	1.57457	1.84215	1.80419	1.71322	1.80185

QUESTION	6	7	8	9	10
CHCS	1.98515	0.79208	0.94060	1.16832	0.54455
AQCESS	1.42857	0.80303	0.98052	0.70563	0.52165

STAN DEV	6	7	8	9	10
CHCS	1.04371	1.49837	1.43046	1.55541	1.18394
AQCESS	1.63507	1.75630	1.68442	1.74572	1.68600

QUESTION	11	12	13
CHCS	1.65347	-0.21287	0.59406
AQCESS	1.38745	0.22294	0.78571

STAN DEV	11	12	13
CHCS	1.18394	1.74471	1.48745
AQCESS	1.50874	1.61301	1.79452

APPENDIX F-3

PENSACOLA vs CHARLESTON

CALCULATED T-VALUE

1	1.0038
2	2.37125 *
3	2.44113 *
4	1.51899
5	2.06814 *
6	2.68497 *
7	0.237516
8	1.99893
9	2.47011 *
10	0.57204
11	1.70795
12	-1.76089
13	-0.843187

FACTOR

A(MID)	-5.044247 *
A(CON)	-1.89340
B	0.382317
C	0.953397

OVERALL 1.28452

* SIGNIFICANT AT ALPHA = .05

APPENDIX F-4

FORT ORD vs CHARLESTON

CALCULATED T-VALUE

1	-1.83458
2	0.648655
3	-1.49233
4	-0.148027
5	-1.33802
6	-3.63284 *
7	0.656472
8	1.12314
9	-1.03273
10	1.22248
11	-0.88007
12	2.29686 *
13	0.95965

FACTOR

A(MID)	-2.55907 *
A(CON)	1.09699
B	0.61843
C	-0.572368

OVERALL -0.353725

* SIGNIFICANT AT ALPHA = .05

APPENDIX G-1

COMBINED RESULTS FOR CHCS AND AQCESS

GENERAL	AVERAGE	INDEX
PHYSICIANS	0.10376	1.348837
STDEV	1.61997	11.15824
ANCILLARY	0.86593	11.42857
STDEV	1.73685	13.86241
ADMINISTRATIVE	0.88229	11.4698
STDEV	1.73962	14.25219

GROUP FACTORS	A (MID)	A (CON)	B	C
PHYSICIAN SAT	0.56202	-0.46899	0.17907	-0.48547
ANCILLARY SAT	1.64286	-0.08571	0.793571	0.559821
ADMIN SAT	1.55593	0.139262	0.927517	0.46896
PHYSICIAN STDEV	1.37496	1.360055	1.505966	1.640625
ANCILLARY STDEV	1.37705	1.79179	1.683394	1.857416
ADMIN STDEV	1.55679	1.768214	1.673756	1.796915
OVERALL AVG	1.55063	-0.06777	0.763441	0.412634
OVERALL STDEV	1.45332	1.751599	1.66848	1.837235

INDIVIDUAL QUESTION RESPONSES

QUESTION	1	2	3	4	5
PHYSICIAN	1	-0.72093	-0.27692	0.06153	-0.092
ANCILLARY	1.63571	-0.29286	0.467857	1.02857	1.0357
ADMIN	1.53356	-0.01007	0.167785	0.88590	0.8322

STAN DEV	1	2	3	4	5
PHYSICIAN	1.48637	1.413688	1.476515	1.75381	1.8437
ANCILLARY	1.41275	1.882234	1.864816	1.69639	1.6493
ADMIN	1.53282	1.834576	1.770006	1.70876	1.6945

QUESTION	6	7	8	9	10
PHYSICIAN	1.02326	-0.75581	-0.05814	0.4418	0.2409
ANCILLARY	1.73571	0.85	1.017857	0.92143	0.4607
ADMIN	1.63423	0.922819	1.218121	0.89261	0.6711

STAN DEV	6	7	8	9	10
PHYSICIAN	1.46253	1.630128	1.630439	1.63971	1.4775
ANCILLARY	1.36073	1.666583	1.557139	1.71575	1.6664
ADMIN	1.59816	1.700005	1.56173	1.70919	1.6423

QUESTION	11	12	13
PHYSICIAN	1.37952	-0.36145	0.295181
ANCILLARY	1.55714	0.121429	0.717857
ADMIN	1.5	0.288591	0.932886

STAN DEV	11	12	13
PHYSICIAN	1.23476	1.517594	1.485951
ANCILLARY	1.35104	1.671047	1.749194
ADMIN	1.53538	1.686087	1.749194

APPENDIX G-2

COMBINED RESULTS FOR CHCS AND AQCESS
PHYSICIANS VS THE REST OF THE SURVEY GROUP

GENERAL	AVERAGE	INDEX
PHYSICIANS	0.10376	1.348837
STDEV	1.48637	11.15824
NON-PHYSICIANS	0.87437	11.44983
STDEV	1.73957	14.06473

GROUP FACTORS	A (MID)	A (CON)	B	C
PHYSICIAN SAT	0.56202	-0.46899	0.17907	-0.48547
PHYSICIAN STDEV	1.37496	1.360055	1.505966	1.640625
NON-PHYSICIANS	1.59804	0.295848	0.86263	0.512976
NON-PHYSICIANS STDEV	1.4731	1.783479	1.679766	1.827038

QUESTION	1	2	3	4	5
PHYSICIAN	1	-0.72093	-0.27692	0.061538	-0.09231
NON-PHYSICIANS	1.58304	-0.27682	0.313149	0.955017	0.930796

STAN DEV	1	2	3	4	5
PHYSICIAN	1.48637	1.413688	1.476515	1.753811	1.843711
NON-PHYSICIANS	1.47676	1.863184	1.822732	1.704274	1.675816

QUESTION	6	7	8	9	10
PHYSICIAN	1.02326	-0.75581	-0.05814	0.44186	0.240964
NON-PHYSICIANS	1.68339	-0.14706	1.121107	0.906574	0.569204

STAN DEV	6	7	8	9	10
PHYSICIAN	1.46253	1.630128	1.630439	1.639705	1.477464
NON-PHYSICIANS	1.48875	1.68429	1.562716	1.712439	1.65739

QUESTION	11	12	13
PHYSICIAN	1.37952	-0.36145	0.295181
NON-PHYSICIANS	1.52768	0.205882	0.82872

STAN DEV	11	12	13
PHYSICIAN	1.23476	1.517594	1.485951
NON-PHYSICIANS	1.44929	1.681623	1.730074

APPENDIX G-3

PHYSICIANS vs THE REST OF THE SURVEY GROUP

CALCULATED T-VALUE	
1	2.40721*
2	1.52642
3	1.98308*
4	3.23135*
5	3.65143*
6	2.78686*
7	2.20323*
8	4.62484*
9	1.68446
10	1.19979
11	0.64683
12	2.10863*
13	1.91295

FACTOR	
A(MID)	4.38365*
A(CON)	2.69228*
B	2.49046*
C	3.41617*

OVERALL 4.52104*

* SIGNIFICANT AT ALPHA = .05

APPENDIX G-4

COMBINED RESULTS FOR CHCS AND AQCESS

ANCILLARY VS THE REST OF THE SURVEY GROUP

GENERAL	AVERAGE	INDEX
ANCILLARY	0.86621	11.42857
ANCILLARY STDEV	1.73663	13.86241
NON-ANCILLARY	0.70753	9.203125
NON-ANCILLARY STDEV	1.74605	14.25906

GROUP FACTORS	A (MID)	A (CON)	B	C
ANCILLARY SAT	1.64286	-0.08571	0.793571	0.560714
ANCILLARY STDEV	1.37705	1.79179	1.683394	1.856906
NON-ANCILLARY	1.43837	-0.05599	0.727909	0.254557
NON-ANCILLARY STDEV	1.53366	1.72398	1.667132	1.807729

QUESTION	1	2	3	4	5
ANCILLARY	1.63571	-0.29286	0.467857	1.028571	1.039286
NON-ANCILLARY	1.41406	-0.17708	0.020833	0.617188	0.557292

STAN DEV	1	2	3	4	5
ANCILLARY	1.41275	1.882234	1.864816	1.696395	1.64595
NON-ANCILLARY	1.53871	1.776553	1.730421	1.790256	1.80331

QUESTION	6	7	8	9	10
ANCILLARY	1.73571	0.85	1.017857	0.921429	0.460714
NON-ANCILLARY	1.4974	0.763021	0.932292	0.791667	0.578125

STAN DEV	6	7	8	9	10
ANCILLARY	1.36073	1.666583	1.557139	1.715758	1.666442
NON-ANCILLARY	1.58935	1.746181	1.647472	1.690455	1.608616

QUESTION	11	12	13
ANCILLARY	1.55714	0.121429	0.717857
NON-ANCILLARY	1.40365	0.065104	0.734375

STAN DEV	11	12	13
ANCILLARY	1.35104	1.671047	1.749194
NON-ANCILLARY	1.4688	1.660958	1.677754

APPENDIX G-5

ANCILLARY vs THE REST OF THE SURVEY GROUP

CALCULATED	T-VALUE
1	-1.45036
2	0.61534
3	-2.40663*
4	-2.18425*
5	-2.55840*
6	-1.44183
7	-0.49104
8	-0.46473
9	-0.71419
10	0.68605
11	-1.06003
12	-0.30922
13	0.10936

FACTOR	
A(MID)	-1.28482
A(CON)	0.11483
B	-0.33643
C	-1.56279

OVERALL -1.48159

* SIGNIFICANT AT ALPHA = .05

APPENDIX G-6

COMBINED RESULTS FOR CHCS AND AQCESS

ADMINISTRATIVE VS THE REST OF THE SURVEY GROUP

GENERAL	AVERAGE	INDEX
ADMINISTRATIVE	0.88178	11.4698
ADMIN STDEV	1.74002	14.2522
NON-ADMIN	0.68705	9.06011
NON-ADMIN STDEV	1.74022	14.25906

GROUP FACTORS	A (MID)	A (CON)	B	C
ADMIN SAT	1.55593	0.137584	0.927517	0.468121
ADMIN STDEV	1.55679	1.768819	1.673756	1.797367
NON-ADMIN SAT	1.52302	-0.23634	0.64918	0.314891
NON-ADMIN STDEV	1.40079	1.721812	1.66395	1.862015

QUESTION	1	2	3	4	5
ADMIN	1.53356	-0.01007	0.167785	0.885906	0.828859
NON-ADMIN	1.48634	-0.40164	0.243169	0.713115	0.704918

STAN DEV	1	2	3	4	5
ADMIN	1.53282	1.834576	1.770006	1.708762	1.697088
NON-ADMIN	1.45556	1.794009	1.826758	1.802304	1.798703

QUESTION	6	7	8	9	10
ADMIN	1.63423	0.922819	1.218121	0.892617	0.671141
NON-ADMIN	1.56831	0.699454	0.765027	0.808743	0.412568

STAN DEV	6	7	8	9	10
ADMIN	1.59816	1.700005	1.56173	1.709197	1.642322
NON-ADMIN	1.41787	1.658675	1.621064	1.695874	1.618458

QUESTION	11	12	13
ADMIN	1.5	0.285235	0.932886
NON-ADMIN	1.44262	-0.07104	0.560109

STAN DEV	11	12	13
ADMIN	1.53538	1.687653	1.749194
NON-ADMIN	1.32266	1.629772	1.692298

APPENDIX G-7

ADMINISTRATIVE vs THE REST OF THE SURVEY GROUP

CALCULATED T-VALUE

1	0.00000
2	-2.01622 *
3	-0.36259
4	-0.95500
5	-0.69139
6	-0.43885
7	-1.09948
8	-2.65698
9	-0.52758
10	-1.57692
11	-0.39612
12	-1.97450 *
13	-2.00788 *

FACTOR

A(MID)	-0.25394
A(CON)	-1.82145
B	-1.68437
C	-1.01902

OVERALL -1.59613

* SIGNIFICANT AT ALPHA = .05

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